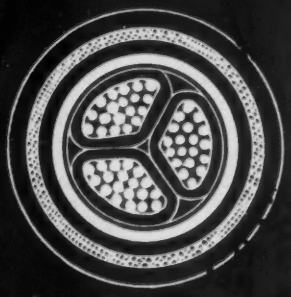
BICC



POWER CABLES FOR WORLD INDUSTRY

BRITISH INSULATED CALLENDER'S CABLES LIMITED, 21 BLOOMSBURY STREET, LONDON, W.C.1

Samicanite AND Samicafolium

ELECTRICAL INSULATION MADE FROM SAMICA

"SAMICA" is mica paper having a high degree of uniformity in both electrical and mechanical characteristics. Samicanite and Samicafolium are insulating materials prepared by impregnating "Samica" with high grade bonding agents, with or without the addition of backing material.

TAPE Samicanite tapes can be supplied impregnated with silicone, epoxide, polyurethane or alkyd resins and backed with glass fabrics either 0.001″ or 0.002″ in thickness.

FLEXIBLE MATERIAL Flexible Samicanite is available in various combinations with presspaper, "Melinex", "Terylene", glass fabrics and Empire varnished materials. They may be bonded with silicone, epoxide, polyurethane or alkyd resins.

FOLIUM Samicafolium is available with either shellac or epoxide bond.

MOULDING MATERIAL Various grades of moulding Samicanite are available with shellac, silicone or epoxide bond.

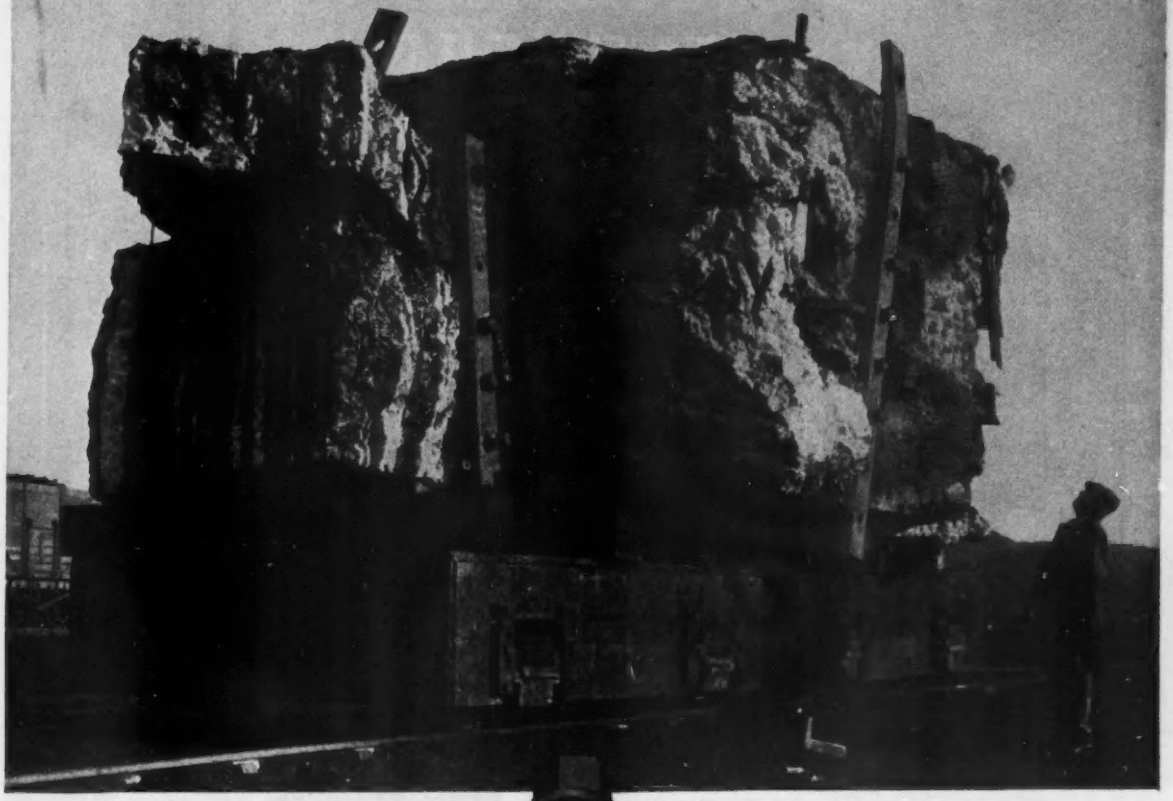
BOARD Hard Samicanite boards are manufactured with epoxide, silicone or alkyd bond.

TUBES AND MOULDINGS These are manufactured from Samicanite with various bonds including shellac, epoxide and silicone.

Insulating materials based on "SAMICA" are available in Great Britain, Northern Ireland, Eire and most of the British Commonwealth through The Micanite & Insulators Co., Ltd., the sole licensee for these territories. "Samica" is our registered trade mark. "Melinex" and "Terylene" are registered trade marks of I.C.I.

m and i

RAWLBOLTS LIFT 100 TON BLOCKS



From Corby comes yet another impressive demonstration of the tremendous grip of Rawlbolts. Here, old concrete foundations had to be cleared for the installation of a new steel mill. They were burst with hydraulic cartridges, then trenched and drilled for 1¾" diameter bolts, reduced and screwed to take K.20 Rawlbolt Shields. By this means removal was carried out in record time.

We are indebted to Stewarts & Lloyds, Ltd., of Corby, Northants, for the above information and permission to use their photograph.

FIXED IN MINUTES

Rawlbolts grip by *expansion*. You drill the material, insert the Rawlbolt, tighten up. The job is ready to take its full load *at once*—no grouting in, no waiting for cement to harden. A Rawlbolt fixing is made in a fraction of the time taken by any other method. Sizes and types for every purpose.

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RAWLBOLTS

FOR SPEED AND STRENGTH

THE RAWLPLUG CO. LTD · CROMWELL ROAD · LONDON · SW7

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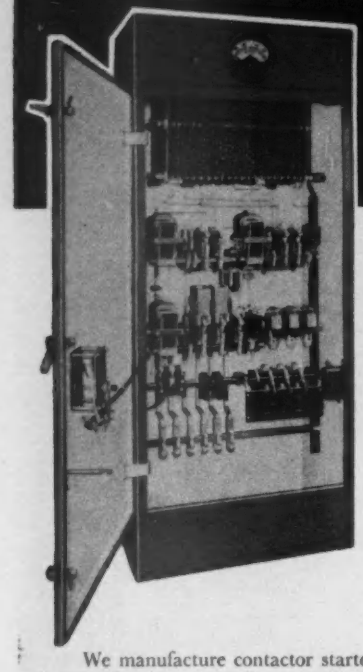
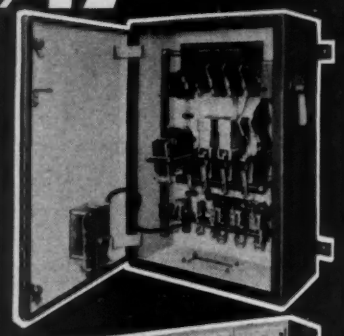
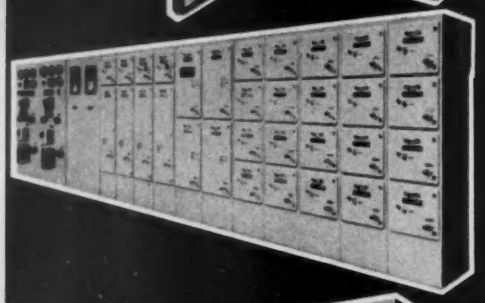
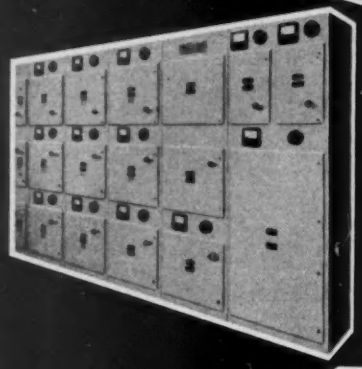
A

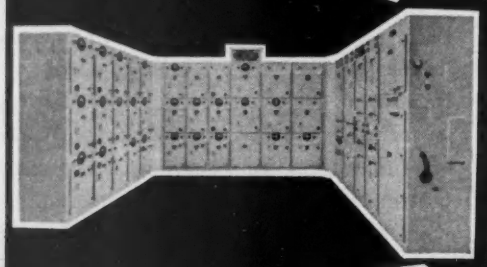
"ERSKINE HEAP" CONTACTOR STARTERS

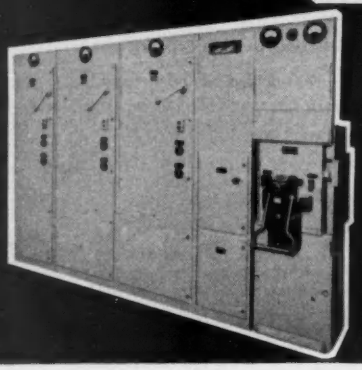












We manufacture contactor starters of the direct-on, star delta or autotransformer pattern for controlling squirrel cage motors, and of the stator and rotor pattern for controlling slip ring motors.

All overloads are of the magnetic type, and above 10 H.P. powerful magnetic blowouts are incorporated. The contactors are mounted on bakelised steel bars and constitute a completely independent unit ready to be mounted in any frame, case or cubicle, and for any combination of equipment.

All contactors can be supplied either with or without fully interlocked isolating switch. All accessories such as ammeters, voltmeters, hand-off-auto switches, control circuit fuses and other instruments can be mounted as required, and the starters can be arranged suitable for 'Local' or 'remote' control or to be operated by float switches, pressure gauges, thermostats, etc.

WE ALSO MANUFACTURE

ALL TYPES OF HAND-OPERATED AIR-BREAK & OIL-IMMERSED STARTERS AND MOTOR CONTROL GEAR

Various multi motor contactor Switchboards are illustrated at the right hand side and control a variety of installations, such as Ventilating and Refrigeration Plant, Boiler House control, Fertilizer Factory and Waterworks Pumping Station.

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SWITCHGEAR SPECIALISTS

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BRANCH OFFICES AND AGENCIES IN ALL PARTS OF THE WORLD

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PRACTICAL TESTS HAVE PROVED THAT
NO CONDITIONS ARE TOO SEVERE
FOR REAL "REFLECTORTIGHT"
NON-CORRODIBLE FITTINGS

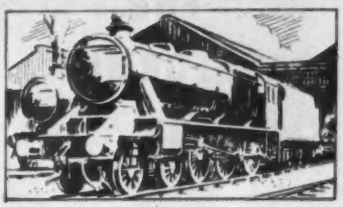
MANY industrial users who first installed "Reflectortight" Fittings for a hazardous situation now regard them as standard equipment for the whole Factory. The clean (and easily kept clean) contour reduces maintenance to a minimum.

The "Reflectortight" range covers:
80 Watt - 400 Watt MBF/U Mercury Discharge Lamps.
100 Watt - 500 Watt G.L.S. Lamps.

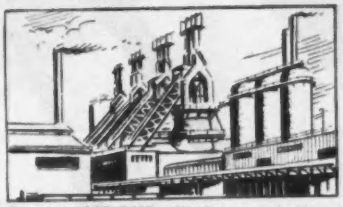
May we send you details?

REAL

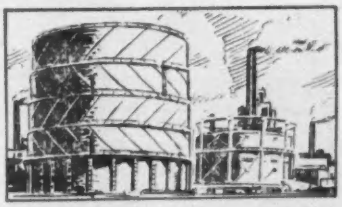
"REFLECTORTIGHT"



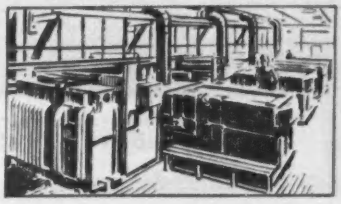
LOCOMOTIVE SHEDS. "Installed over a railway turntable . . . not been attacked in any way by the corrosive fumes . . . interior of the reflectors perfectly clean".



STEEL WORKS. "Reflectortight fitted in Sulphate House—no noticeable corrosion, reflector found to be in perfect condition".



GAS WORKS. ". . . used under heavy fine coke dust conditions, the temperature is 180°F. continuous and intermittent . . . Reflectortight giving good service".



ELECTRO PLATING WORKS. "We would say that, in our opinion, it is a fitting ideally suitable for the corrosive atmosphere of a Plating Shop".

R.E.A.L. *is the registered trade mark of*
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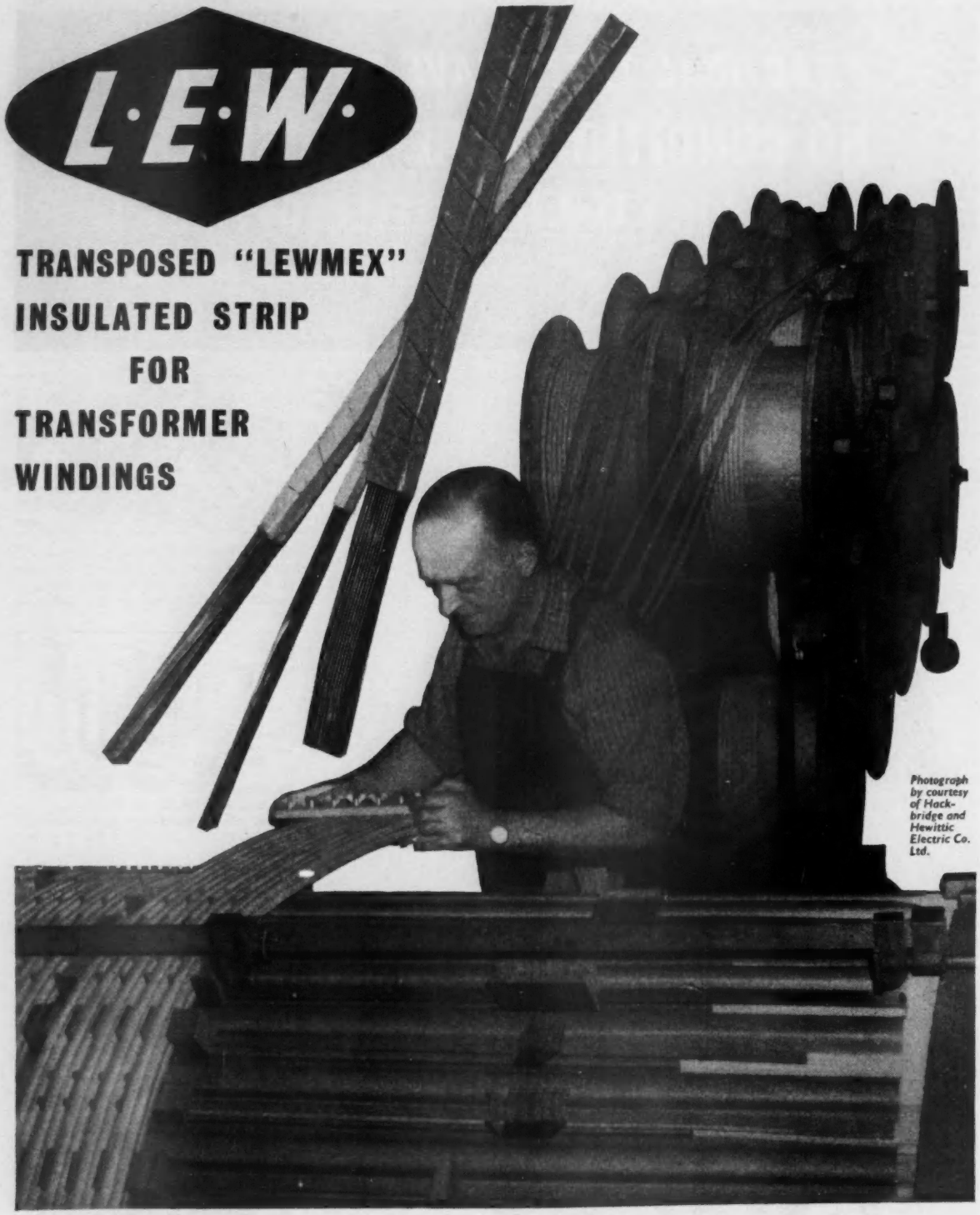
L·E·W·

TRANSPOSED "LEWMEX"
INSULATED STRIP
FOR
TRANSFORMER
WINDINGS



Photograph by courtesy of Hackbridge and Hewittic Electric Co. Ltd.

Transposition
5 to 29 Strips

Strips from ·050" to ·100" thick
·120" to ·300" thick

THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED

LEYTON · LONDON · E10

Whatever started it, one thing is certain; *combustible materials kept it going.* It's sound sense, then, to investigate the proved qualities of Het Acid. Materials fabricated from polyesters based on Het Acid will not support combustion. Unfed, the fire dies at source.

In addition, Het Acid based resins offer fabricators:
☐ High strength with light weight ☐ Non-deterioration of fire-retarding properties in all climates ☐ Resistance to corrosion and chemical attack ☐ Resistance to temperatures up to 150°C.

HET ACID for self extinguishing polyesters

POLYESTER RESINS based on Het Acid have already been used to advantage for: roof lighting and decorative translucent panellings; boat construction; chemical plant; housing for motors and electrical equipment; insulating laminates for switch-gear; ductings in aircraft; the manufacture of radomes, and many other applications. Resins based on Het Acid open up exciting possibilities to fabricators in every field of industrial research and development.

These polyesters are made by leading resin manufacturers. We will be pleased to send you complete information on request.

ALBRIGHT & WILSON (Mfg) LTD

SECTION HR5, Organic Chemicals Department
1 Knightsbridge Green, London, S.W.1. KEN 3422

OC/33

1912-1961

THE STORY OF

BELLING & COMPANY LIMITED

No. 40 OCTOBER 1961

Half-Yearly Report of the Governing Director to all Employees and also to our many customers and friends in the Electrical Trade

We have now completed the first six months of our current year and I am very gratified to be able to report that our sales from the 1st April to 30th September have increased by 20% over the same period of last year. This I think is a first-class effort, bearing in mind present day conditions, and it is also getting quite near to our target figure of 25% which we set for ourselves.

Profits: In spite of the many advances in the cost of materials and increased wages during the period in question we are so far still managing, by improved methods of production and higher productivity, to hold our own without increasing our prices to the public. As an incentive for the forthcoming six months I shall again be paying out an interim share of the profits to all our employees at the same rate as we did this time last year.

Prospects: For the next six months I think these are reasonably good providing there are no serious world complications of any kind. You will be pleased to know that our Works have been operating at full capacity throughout the year as usual, fortunately without any short time or redundancy. We are continually adding to our employees which number some 3,300 at the present time.

Fires: Both radiant and convector types are now selling extremely well and this in spite of the fact that the early Autumn weather was rather warm. However, we have very good stocks both at Enfield and Burnley, but now that there is a nip in the air we do not expect these will last very long.

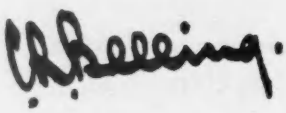
Cookers: Our Classic 60 four-plate cooker is forging rapidly ahead and is earning high praise for its "Classic" appearance and its many practical features, which the modern housewife has been quick to appreciate. Our 47AB and 48 models are, of course, also selling strongly and, as a matter of fact, our 47AB is still our biggest and best seller.

Extensions: These have proceeded quite well in the last six months in spite of bad weather. Our new buildings at Enfield and Burnley are partly in use and will be in full production fairly soon. We shall then have well over 1,000,000 sq. ft. of production space at work. Incidentally, our total area of land (all freehold) is about 70 acres so we have plenty more building space available.

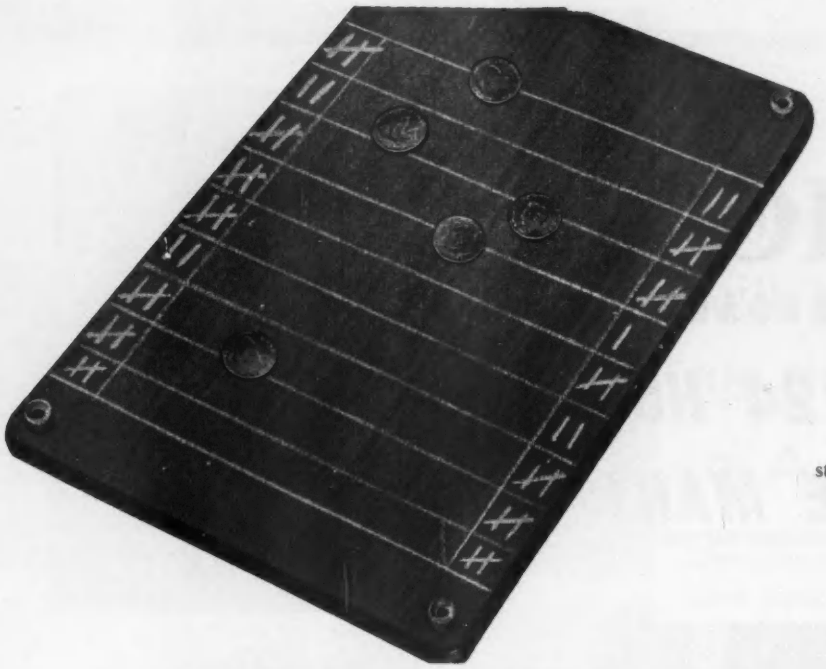
Advertising: I hope you have noted our special efforts in this direction which have already brought in many thousands of applications for our new catalogue every week. We are glad to have been able to maintain our old prices, as this makes it simpler for everyone. Our present issue is 500,000 large catalogues and we hope to be repeating this shortly. We feel that every catalogue distributed sells something so please do not hesitate to let us know your requirements.

We do look forward to your support again this coming fire and cooker season and I think one point I might mention is that our capital, labour and material are all entirely British and our profits remain in England. Of these latter we distribute a fair proportion to our employees, and the balance, after payment of tax and the few odd pence I take out myself personally, goes back into further extensions. This current year, for instance, we have already spent over £200,000 on extensions so we do hope to be able to meet your requirements perhaps a little more promptly than in the past.

We are still in the happy position of not owing anything to anyone, having no mortgages or debentures and no Bank overdraft. I shall be having much more news for you in my annual report at the end of March 1962 which you may remember is our Golden Jubilee Year.



Belling & Co. Ltd., Bridge Works, Enfield, Middx. HOWard 1212



Wootton meter boards win every time!

Obviously, when they're Wootton-made, and Wootton-tested. Made from the best plywood Wootton could lay hands on. Tested for reliability . . . toughness . . . durability. Wootton meter boards stand up to anything. No contraction or expansion or warping with Wootton! Oh, and there's more to Wootton than just meter boards. They make wood blocks too, and instrument cases, and they're brilliant at sunk switch boxes.

WOOTTON–the meter board people

WOOTTON & CO. LTD
ALMA WORKS · PONDERS END · MIDDX
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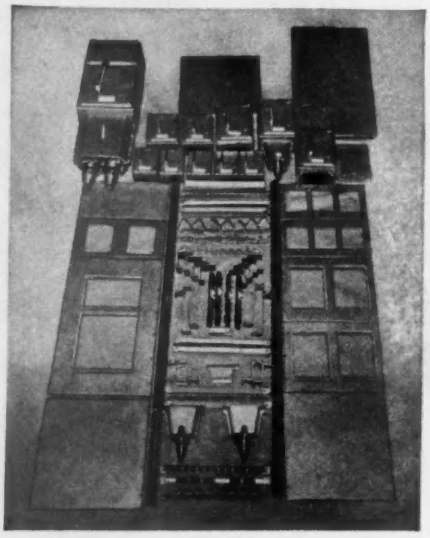
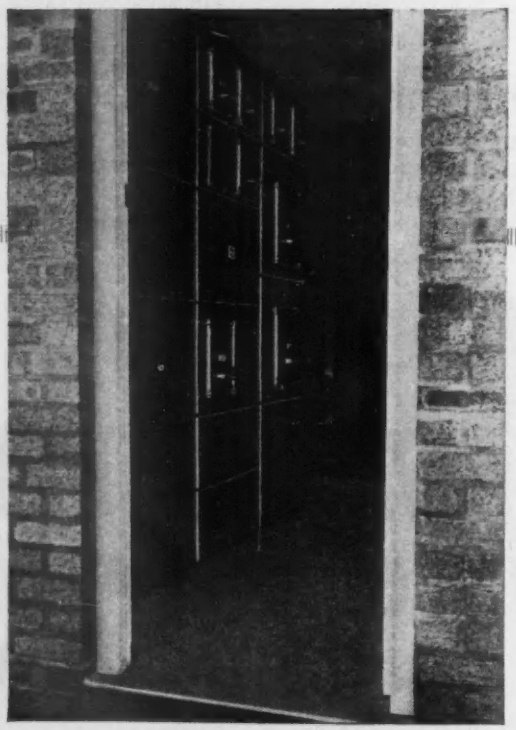
ESTD. 1912

CUBICON
SWITCHBOARD
BUILT IN 24 HOURS
BY ONE MAN!





IN A SWITCHROOM MEASURING ONLY 12ft x 6ft x 7ft 6ins HIGH

This 'CUBICON' cubicle switchboard was built and installed by the Midlands Electricity Board at Sebright School, Kidderminster.

In 12 hours, one man had erected the cubicle inside the switchroom. In 24 hours, including erection time, the cubicle was fully installed and interconnected.

The switchroom was, in fact, too small to allow the photograph of the board to be taken except through the open doorway. This board was built from sets of packaged 'CUBICON' components and 'TS' switches without any factory assistance or prompting, although this, of course, is readily available if required.

Photographs by courtesy of The Midlands Electricity Board and The Governors of Sebright's Endowed Schools, Wolverly, Worcs.

*** LET CUBICON SOLVE YOUR CUBICLE SWITCHBOARD PROBLEMS** *Fill in the coupon below for full details.*

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GLASGOW 73 Robertson Street, Glasgow C.2. *Tel: CENtral 2479*

To DORMAN & SMITH LTD., Preston, Lancashire.

Please send me details of the Dorman 'CUBICON' system of Cubicle Switchboard Construction.

NAME.....

POSITION.....

FIRM.....

ADDRESS.....

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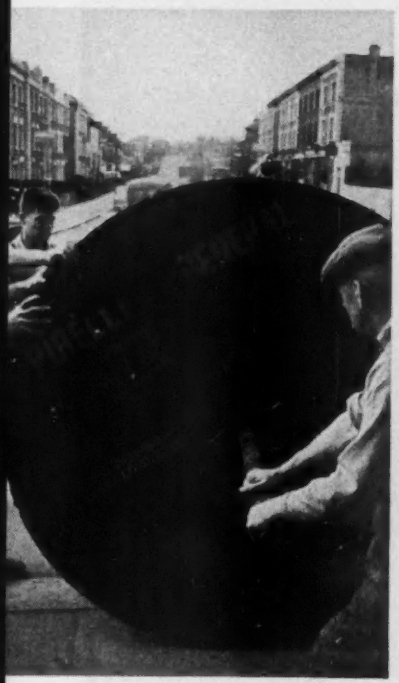
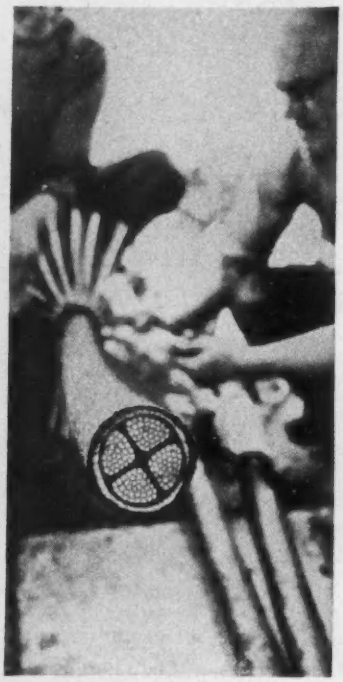
ALCAN Aluminium makes things cheaper to own





These cables will be as good as new in A.D. 2011

These gangers and jointers are laying cables made with aluminium conductors. It's a sight that is becoming increasingly familiar in British cities, from London to Glasgow. It means power PLUS for homes, factories, offices and mines. The PLUS is Alcan aluminium in those conductors. They will still be carrying their load 50 years from now.

The gangers are installing 4 core ·3 sq. in. low-voltage distribution cables. Aluminium is also increasingly used in high-voltage and extra-high-voltage feeders. It has great advantages for the sheathing of pressure-type cables. Jointing presents no problems.

Today, aluminium is the cheapest conductor material. Alcan production capacity and Alcan research make sure that it will hold its lead.

Cable manufacturers can give you further advice on aluminium cables. Write to them, or write to us:
Alcan (U.K.) Limited,
Aluminium Canada House,
30 Berkeley Square, London W.1.
Telephone: Mayfair 9721.

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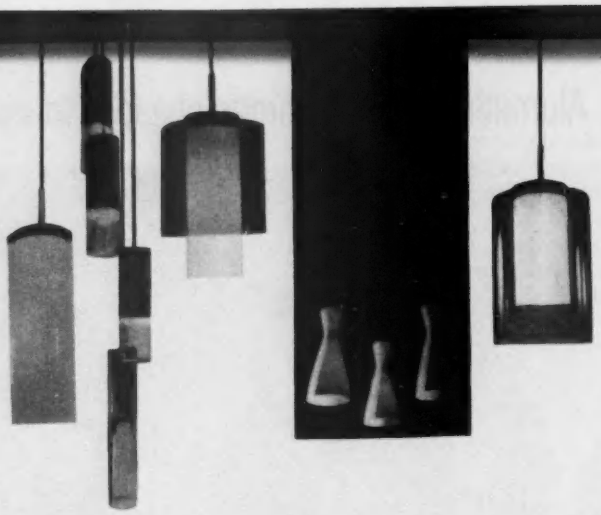
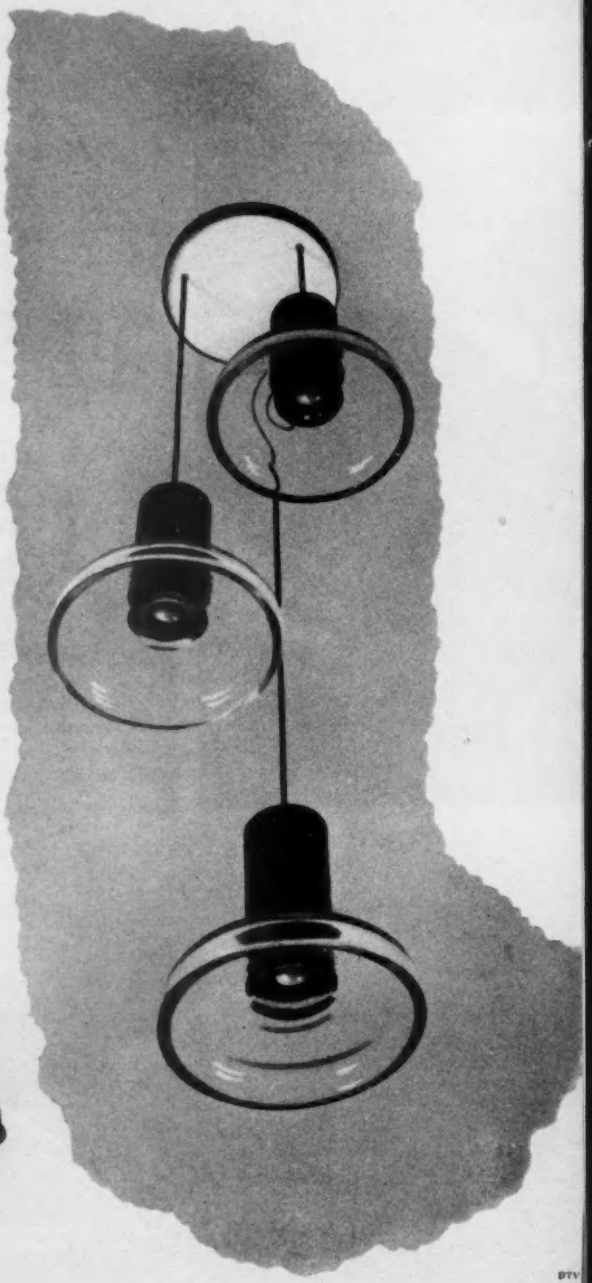


atlas *fine glassware for domestic & decorative lighting*



a ATLAS LIGHTING LIMITED, A subsidiary company of Thorn Electrical Industries Limited · THORN HOUSE · UPPER ST. MARTIN'S LANE · LONDON · WC2

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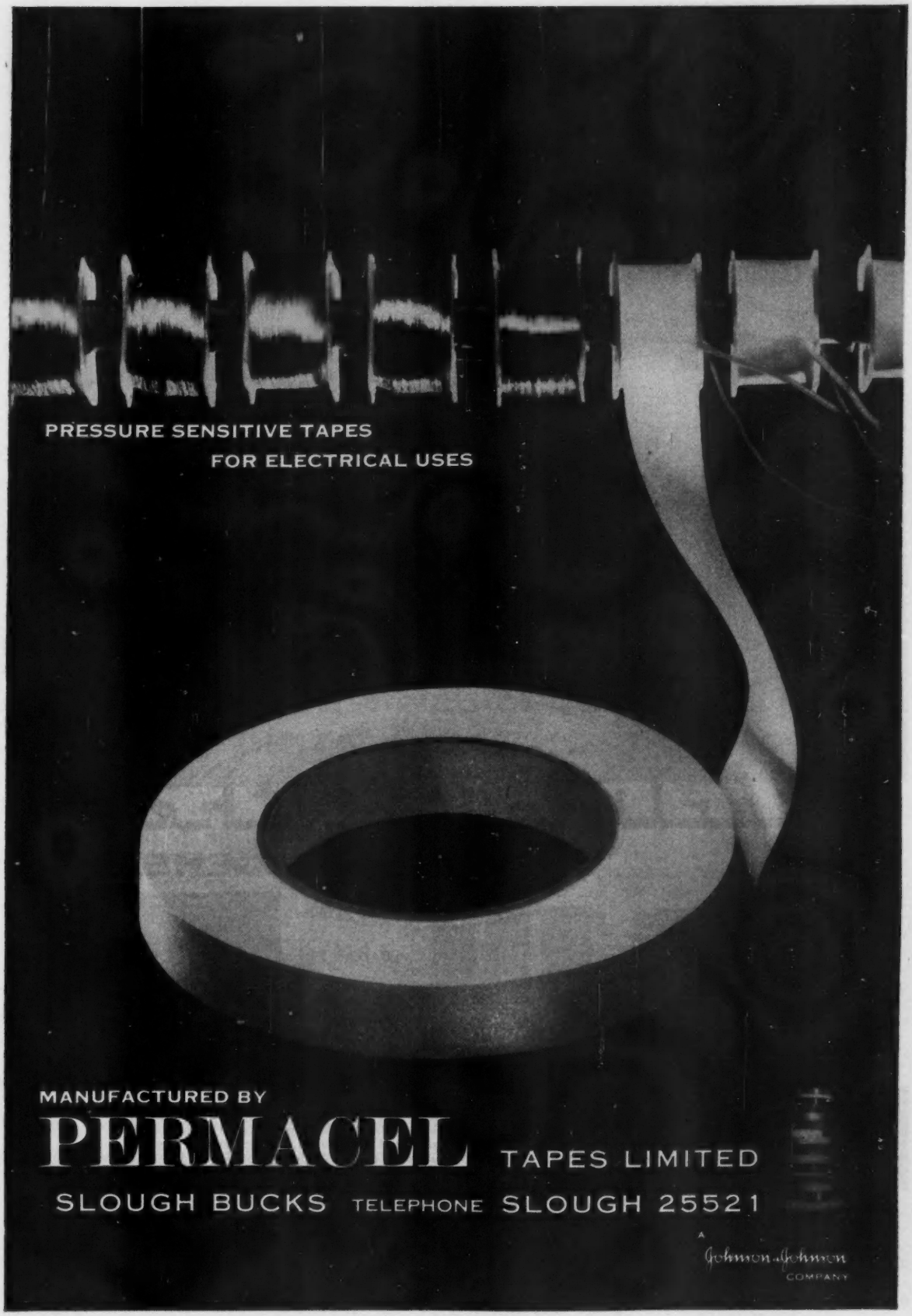
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TETRA FINROD elements for oil pre-heating; convection heating; infra-red drying of grain, rubber, tobacco, timber and many other applications; heat exchangers and defrosting of commercial refrigeration equipment.

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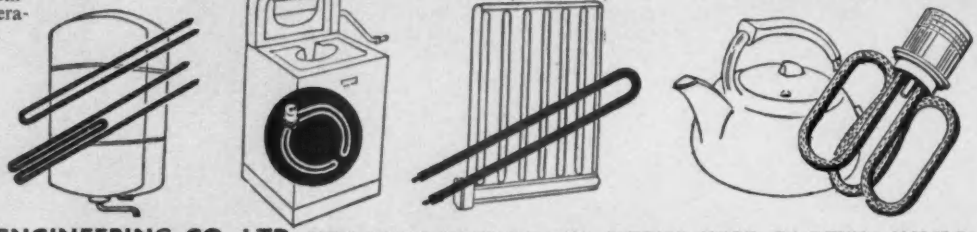
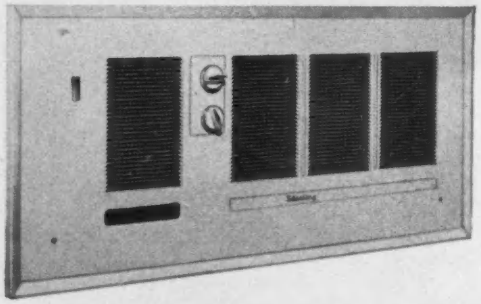
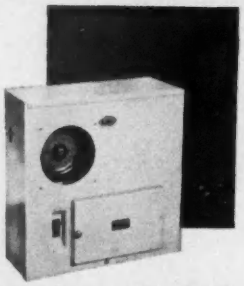
for Infra-red heaters—



THE TETRA ENGINEERING CO. LTD, TETRA WORKS, NORTH END ROAD, WEMBLEY, MIDDX. Tel: WEMbley 1066 (5 lines)

The Most Up-to-date & Economical
ELECTRIC CENTRAL HEATING SYSTEM
Sterling Axiatherm
SPACEHEATER





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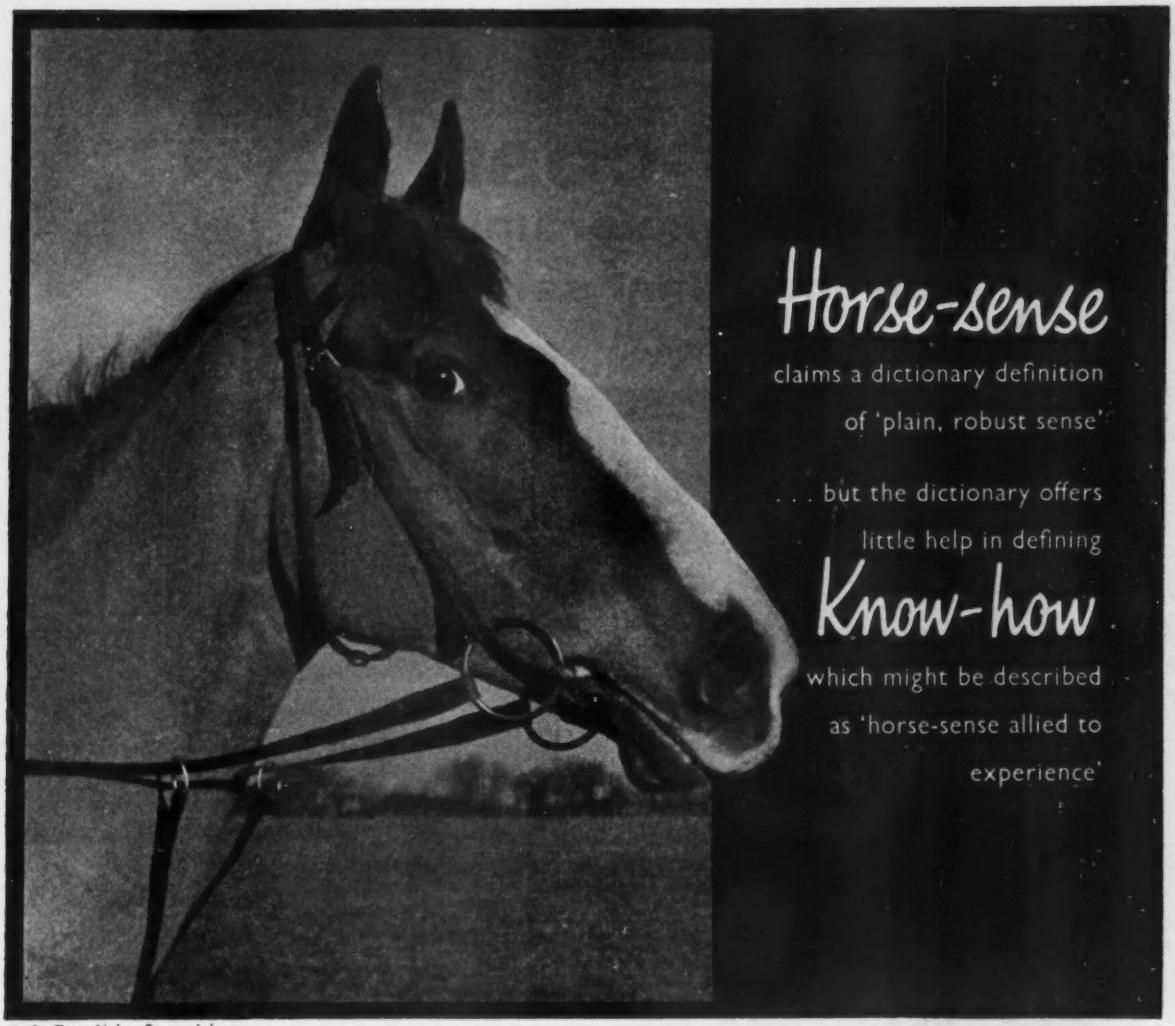
Up to now the electricity world has had no adequate system to offer in competition with the central heating advertising campaigns currently in force by the Coal, Gas and Oil Industries.
The Sterling AXIATHERM is the Electrical Trade's answer to the ever growing demand for central heating in the home, shop and office. A system based on the cleanest, most efficient and cheapest heating medium available today—Electricity.
It is new in conception, brilliantly designed, precision built and simplicity itself to install. The AXIATHERM is a packaged system consisting of any number of spaceheaters wired to a central Control Unit incorporating a time clock for economy of operation. Each spaceheater is individually thermostatically controlled to provide higher efficiency of individual room temperature control combined with greater economy.
Increase your profits by selling the Sterling AXIATHERM Central Heating System—write NOW for full particulars.

STERLING DOMESTIC APPLIANCES LTD., 8/9 BERKELEY STREET, W.1. *HYD 1561 (10 lines)*



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as manufacturers of **electric motor control gear,**
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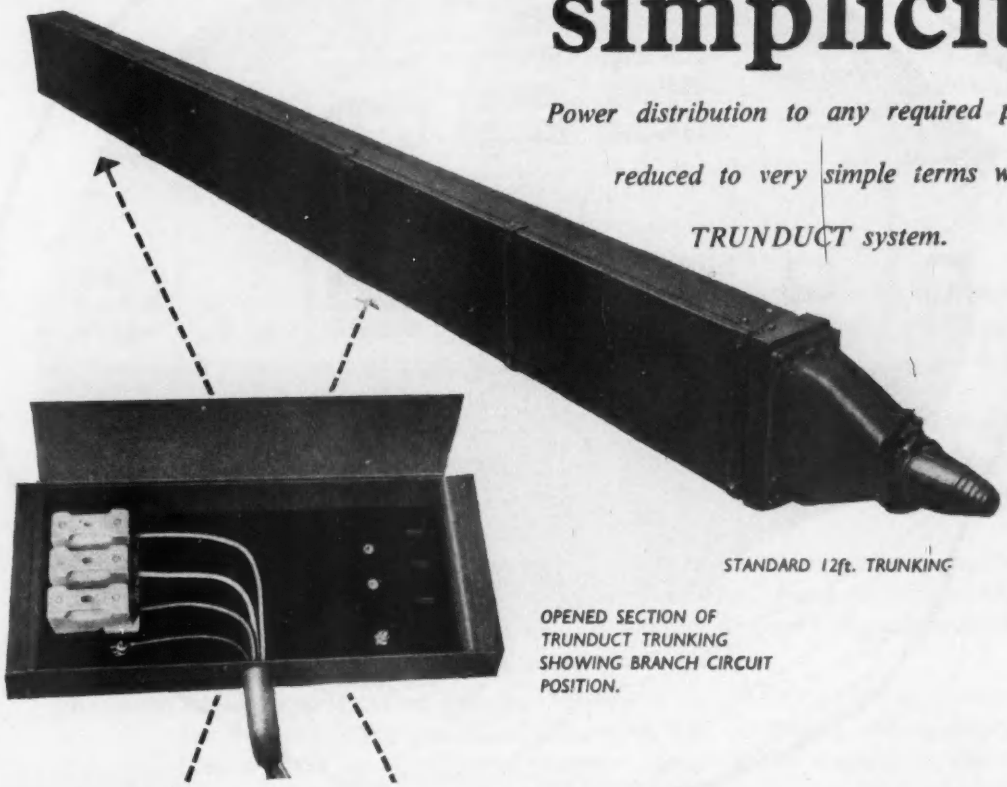

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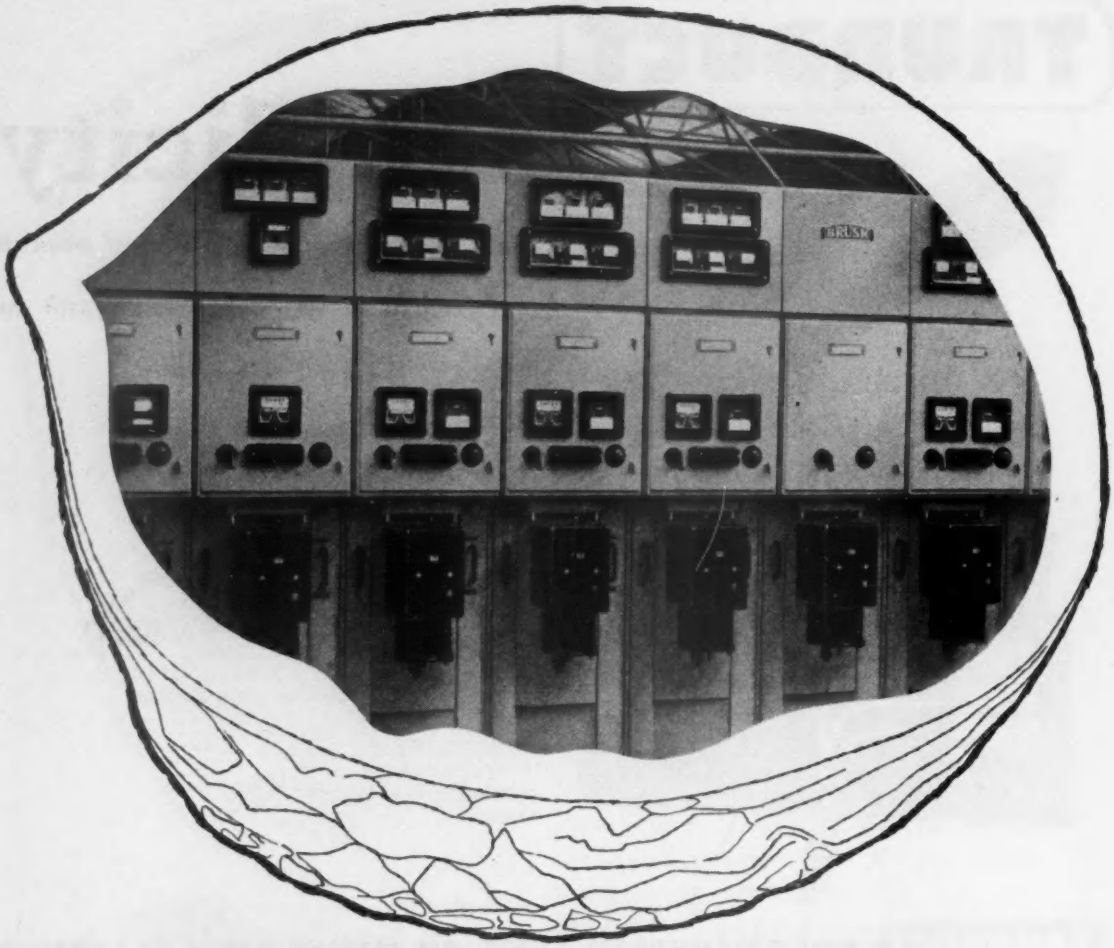

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NEWS SHEET

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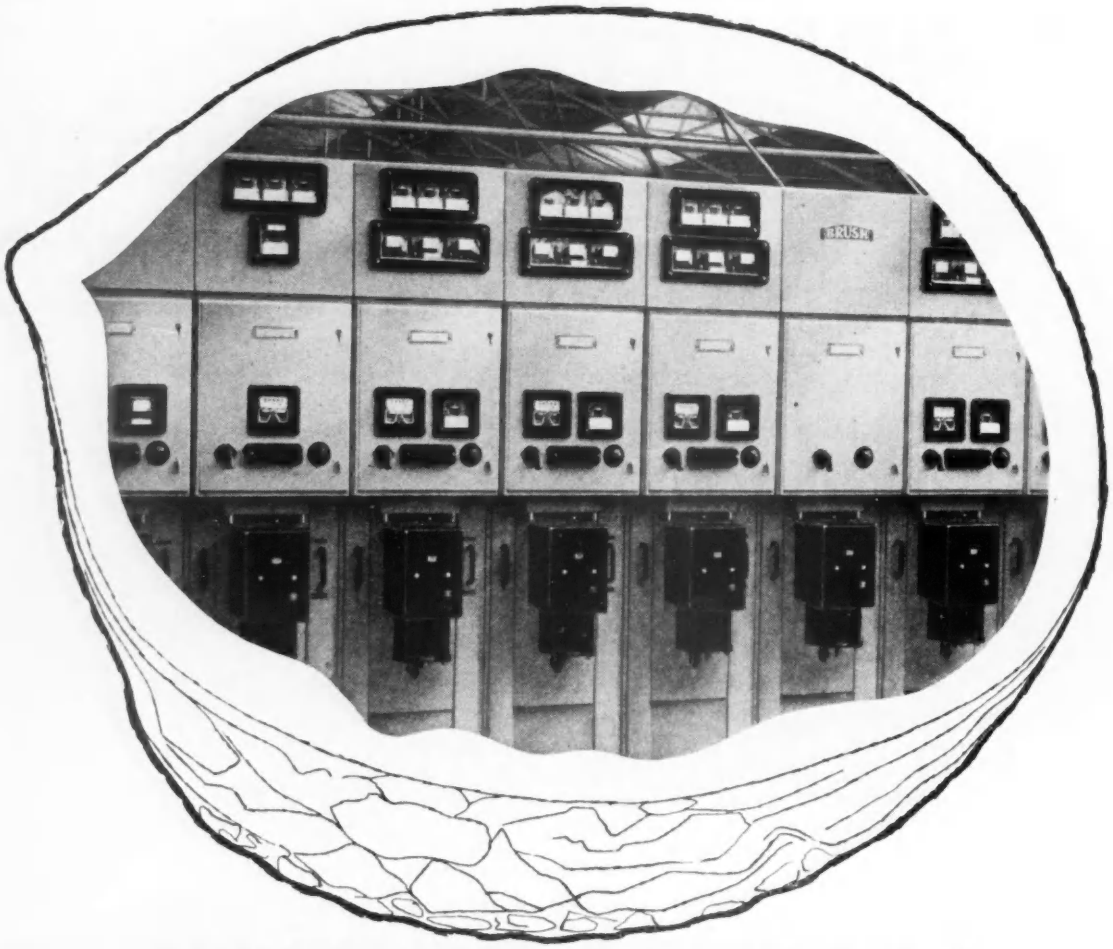

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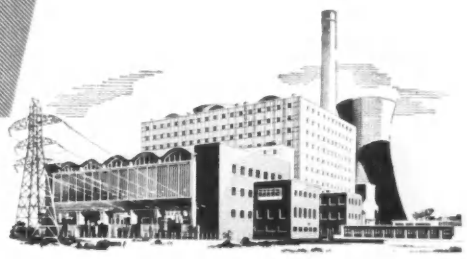
'Ferrybridge' WILL BE BRITAIN'S GREATEST CONCENTRATION OF POWER GENERATING PLANT 2,470 MW

CENTRAL ELECTRICITY GENERATING BOARD
(YORKSHIRE DIVISION)

FERRYBRIDGE A
First EIGHT BOILERS 1927
Two 20 MW sets

The first eight boilers of the first Ferrybridge station — Ferrybridge A — built in 1927 by the Yorkshire Electric Power Co., were 57,000 lb./hr. units steaming two *20MW* turbines and were supplied by The Stirling Boiler Company Limited, a member of the BABCOCK organization.

FERRYBRIDGE B
THREE BOILERS 1957-59
Three 100 MW sets



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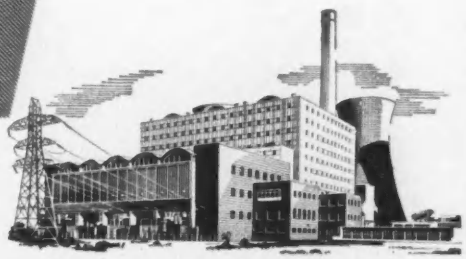

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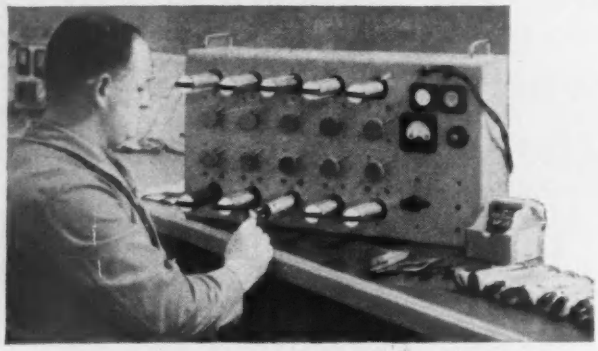

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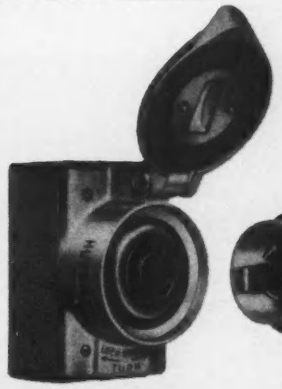

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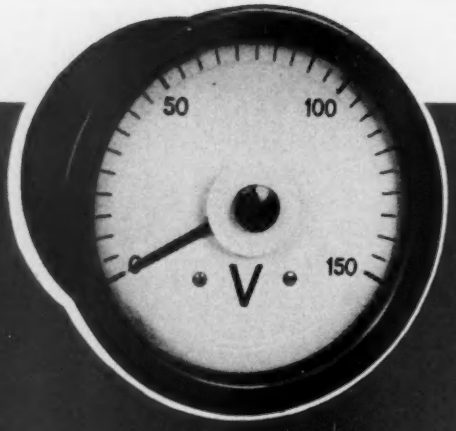

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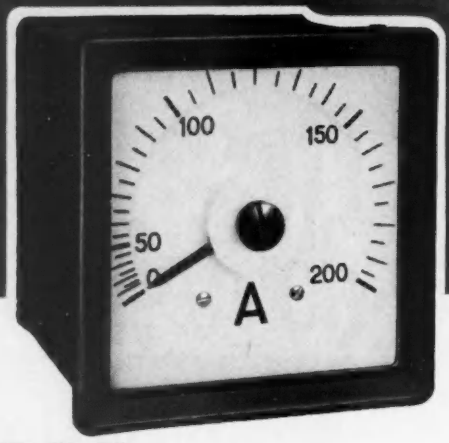

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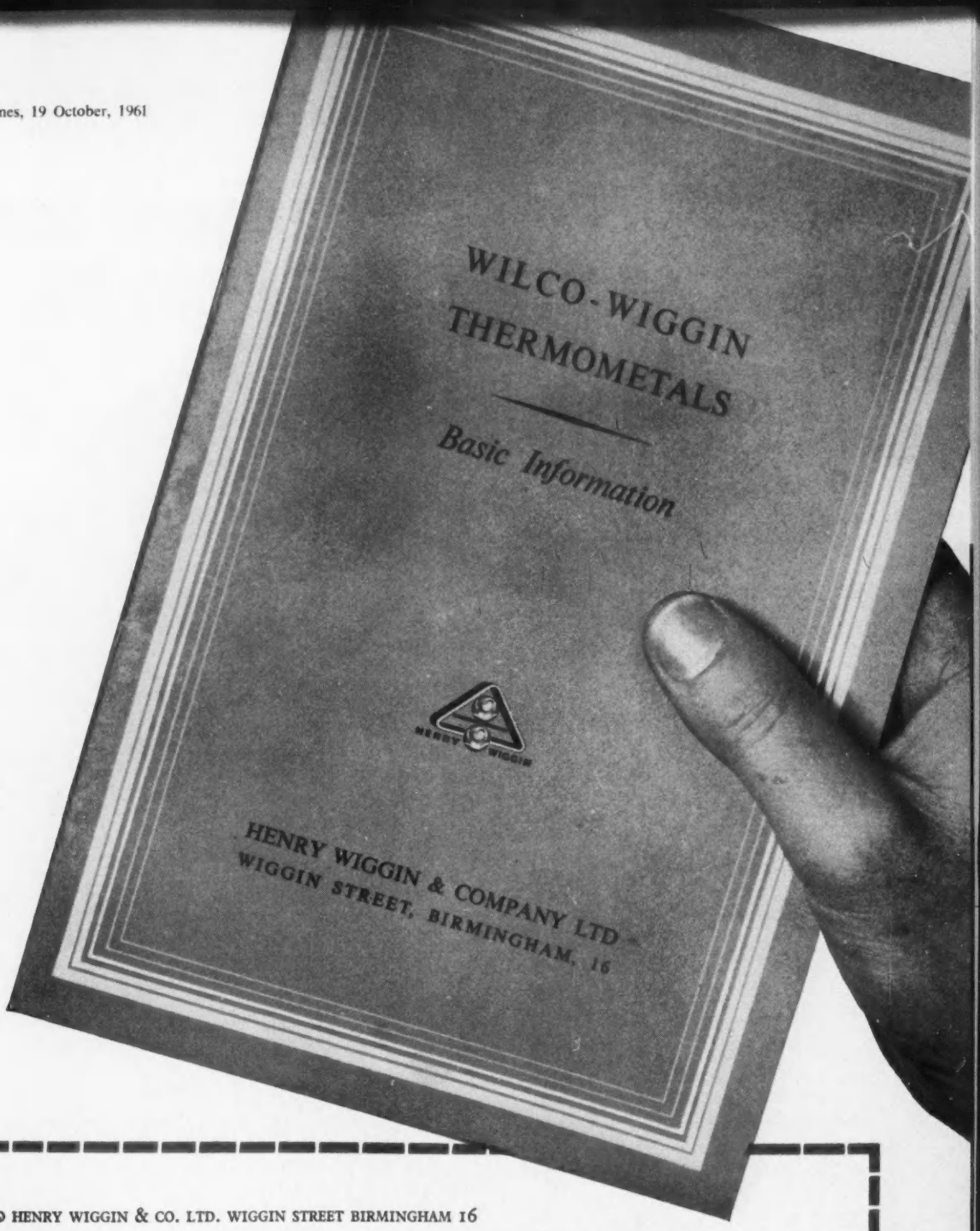

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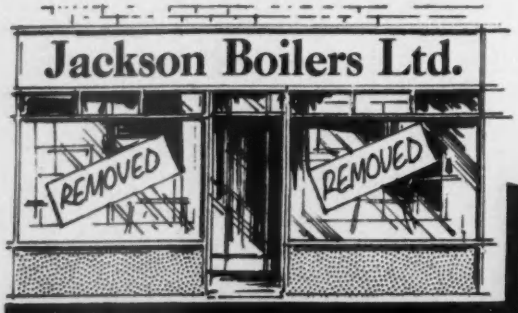

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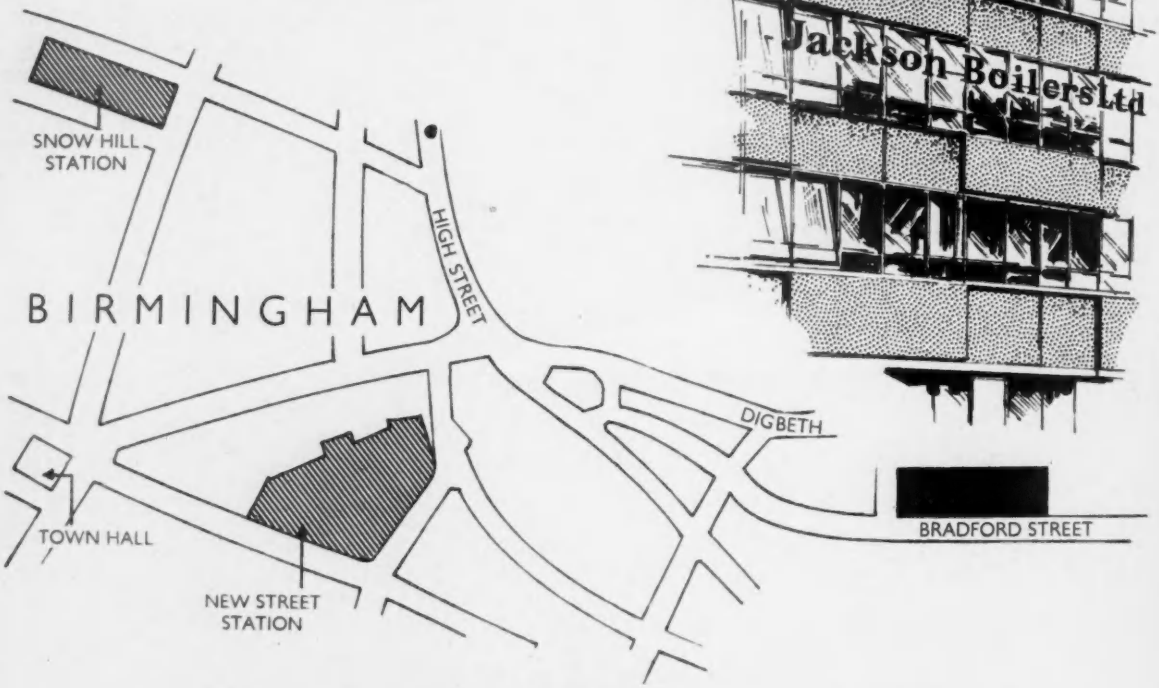

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These exclusive features make 'Hidutac' switchfuses vastly superior for tungsten and discharge lighting control, motor control, and transformer and capacitor switching.

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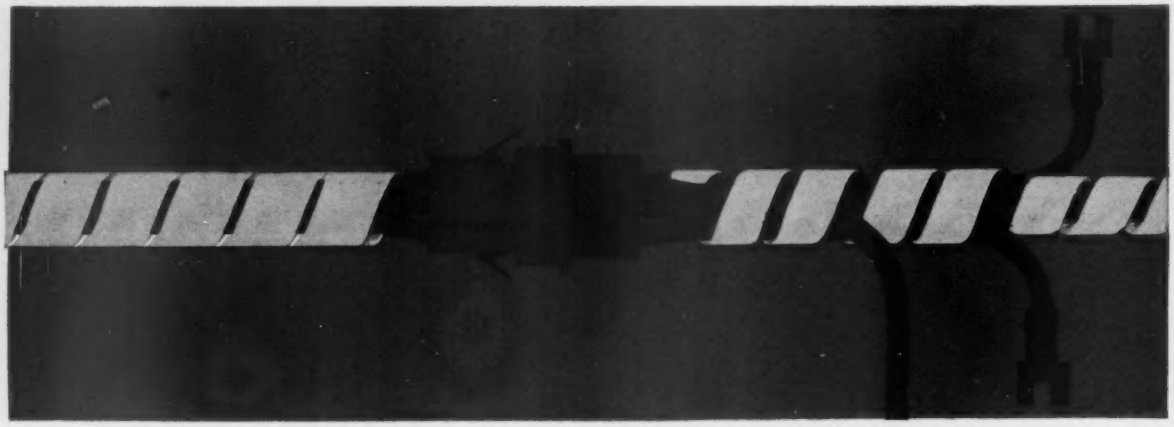

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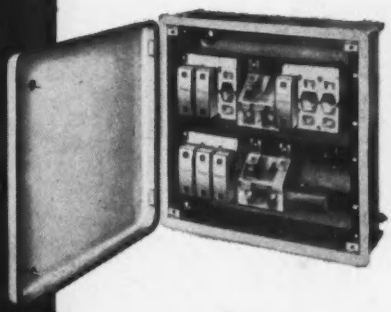
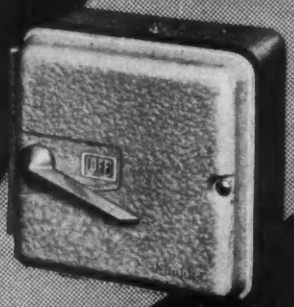
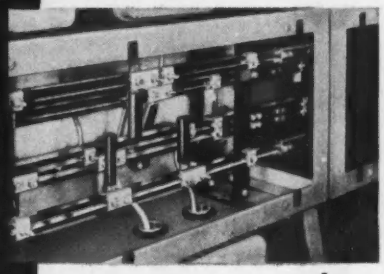
ARE YOU AS UP-TO-DATE AS THE SIMPLEX STAR RANGE OF SWITCHGEAR ?







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Proved on test and in use, the Simplex Star range is styled in the modern manner and is selling at competitive prices.

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Busbar chambers 200, 400, 600, 800 amp. 600 volt.
Distribution fuseboards 15, 30, 60 amp. 500 volt.

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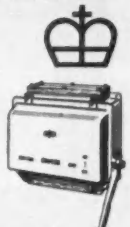
Complementary Simplex Regent range. Robust, stylish switches, switchfuses, changeover switches 15, 30, 60, 100 amp. 500/600 volt. Busbar chambers 350, 550, 800 amp. 600 volt. Distribution fuseboards 15, 30, 60 amp. 500 volt.



Complementary Simplex Monarch range. Heavy duty fuse switches. Suitable for all lighting, heating and power loads without de-rating. 150, 300 amp. 500 volt. S.4.

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Indestructible operator is made entirely of metal. High-density polyethylene colour caps are permanently coloured, won't fade or deteriorate on even the toughest jobs. Pushbuttons are completely oil-tight even when depressed. Order pushbutton in the colour you want or get the basic operator and with a small stock of colour caps, decide your colour at the point of application. Colour caps just "Pop-on" - may be changed in seconds if necessary—design leadership AT NO EXTRA COST. Seven colours available. Choose from black, red, green, brown, yellow, orange, blue.

WRITE FOR PRODUCT NEWS No. 9001 — 2CC

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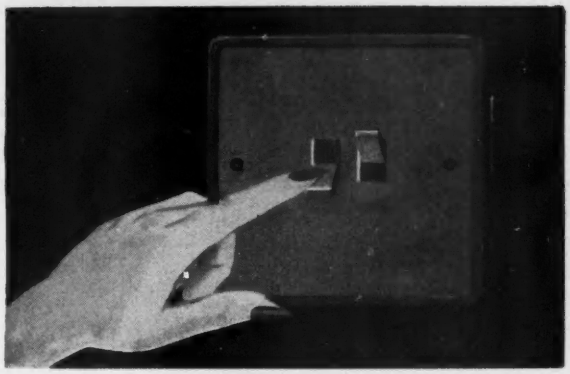

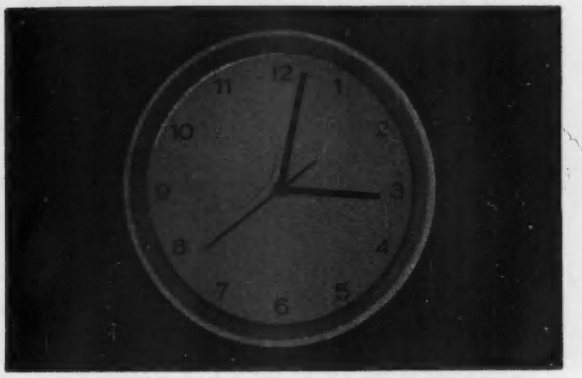

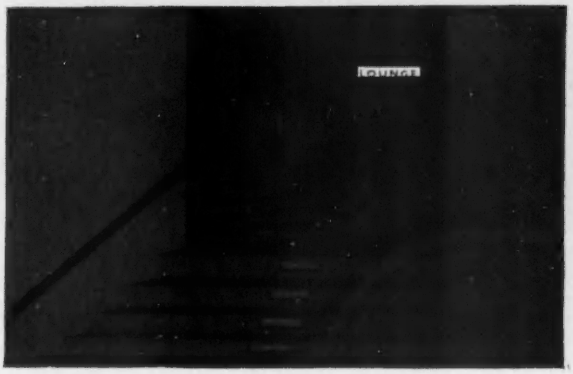

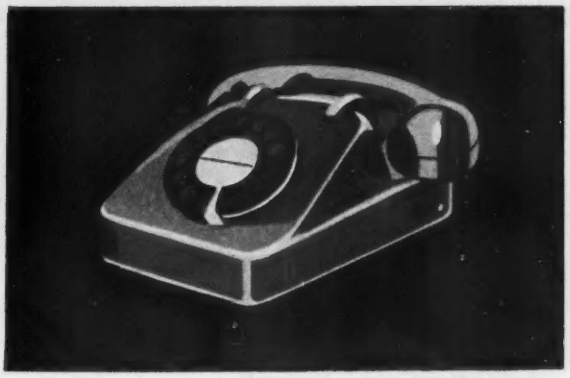

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Thorn Electrical Industries Limited who pioneered the commercial use of electroluminescence in the form of Panelume lamps for aircraft cabin signs, are now able to offer this new light source for domestic applications.

Panelume lamps are rugged, long-life, luminous steel panels that have no filaments, no cathodes, no glass envelopes. They are particularly suitable for incorporating into products which need to be seen in the dark. Other features include:

Surface Brightness – 1 to 3 foot lamberts.

Life Expectation – 40,000 hrs. to half brightness.

Running Costs – 0.3 mA per square inch at 250V AC 50cps (less than 1d. per annum).

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Colours Available – Blue and green.

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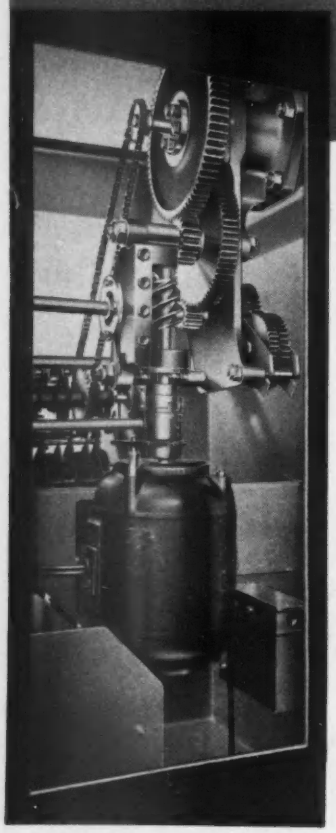

Motor Gear Box and Timing Gear

- Suitable for 3-phase circuits from 33 kV. upwards, in four versions: 45, 70, 100 and 140 kV. r.m.s. (neutral test).
- Also usable within agreed voltage ratings where neutral is insulated.
- 19 tapping steps (20 positions) available.
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- Separate oil compartments for selector, diverter and driving mechanism.
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- Freedom from routine lubrication and corrosion of mechanism.
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CENTRAL ELECTRICITY GENERATING BOARD

TARIFF FOR BULK SUPPLIES TO AREA BOARDS

fixed by the Central Electricity Generating Board (the Generating Board) pursuant to section 37 (1) of the Electricity Act, 1947, for the year ending 31st March, 1963.

KILOWATT CHARGE IN RESPECT OF SUPPLIES OTHER THAN FOR SPECIAL CONSUMERS

£8 per kilowatt of that proportion of the prescribed national demand of 29,000,000 kilowatts which the **average demand of the Area Board** bears to the sum of the average demands of all Area Boards and **the average demands of all direct consumers of the Generating Board.**

BASIC DAY RUNNING CHARGE

0.58d. for each kilowatt-hour supplied during the sixteen hours between 7.0 a.m. and 11.0 p.m. of each day during the year.

BASIC NIGHT RUNNING CHARGE

0.47d. for each kilowatt-hour supplied during the eight hours between 11.0 p.m. and 7.0 a.m. of each day during the year.

FUEL COST ADJUSTMENT RATE

The above basic day and night running charges to be increased or reduced by 0.000495d. for each penny (a halfpenny or any greater part of a penny being treated as a penny) by which the **fuel cost per ton** in the year shall be above or below 85 shillings.

KILOWATT CHARGES IN RESPECT OF SUPPLIES FOR SPECIAL CONSUMERS

(i) £8 per kilowatt of the sum of **the nominated firm kilowatts** and the **excess kilowatts.**

(ii) £8 less a rebate of £4.2.0 per kilowatt of the **restrictable demand** or, in the case of application to an existing load, such reduced rebate during an initial period of 3 years as will reflect the savings which the Generating Board expect to make by the restriction of demand.

For the above purposes:—

(A) **"The average demand of the Area Board"** means the sum of the number of kilowatt-hours supplied to that Board for consumers other than **special consumers** during

(i) the half-hour in which the highest number of kilowatt-hours was supplied by the Generating Board to all Area Boards and direct consumers before midnight on 31st December in the year of account,

(ii) the half-hour in which the highest number of kilowatt-hours was so supplied after midnight on 31st December in the year of account.

(B) **"The average demands of all direct consumers of the Generating Board"** means the sum of the number of kilowatt-hours supplied to such consumers not being **special consumers** during

(i) the half-hour in which the highest number of kilowatt-hours was supplied by the Generating Board to all Area Boards and direct consumers before midnight on 31st December in the year of account,

(ii) the half-hour in which the highest number of kilowatt-hours was so supplied after midnight on 31st December in the year of account.

(C) **"Special consumers"** means a consumer who has agreed that (without prejudice to any statutory right to discontinue the supply of energy) his kilowatt demand can be restricted by the Generating Board for up to 2 hours on any occasion and up to an aggregate of 50 hours in the year provided that

(i) the supply is afforded to the consumer's premises directly from a generating station or substation of the Generating Board through circuits not used for supplies to other consumers;

(ii) the difference between the **maximum demand of the special consumer** and his nominated firm kilowatts shall be not less than 25,000 kilowatts;

(iii) suitable provisions have been made in respect of the costs of connection and the technical arrangements for operation, control and metering, which may vary with local circumstances;

(iv) prior agreement has been made between the consumer, the Area Board, and the Generating Board, in the case of a consumer of the Area Board;

(v) the payment of a charge for **excess kilowatts** on one occasion will not entitle the **special consumer** to exceed his **nominated firm kilowatts** without additional charge during any subsequent period of restriction.

(D) **"Restrictable demand"** means the difference between the

(i) **maximum demand** of the **special consumer**, and

(ii) the **nominated firm kilowatts** and **excess kilowatts** of that consumer.

(E) **"Maximum demand of a special consumer"** means twice the largest number of kilowatt-hours supplied to the **special consumer** during any half-hour between 7.0 a.m. and 7.0 p.m. on any day except Saturdays, Sundays and Bank Holidays.

(F) **"Nominated firm kilowatts"** means the **five-minute kilowatt demand** which in accordance with the above arrangements the **special consumer** is entitled to make during a period of restriction. For this purpose **"five-minute kilowatt demand"** means twelve times the number of kilowatt-hours supplied to the **special consumer** in any consecutive five minutes.

(G) **"Excess kilowatts"** means the amount by which the **nominated firm kilowatts** is exceeded by twelve times the largest number of kilowatt-hours supplied to the **special consumer** in any five minutes (excepting the first five minutes) during any period commencing when the Generating Board indicate (by a signal or otherwise) that they require his demand to be restricted in accordance with the above arrangements, and ending when the Generating Board indicate that normal supply may be resumed.

(H) **"Fuel cost per ton"** in any period shall be either

(i) the quotient produced by dividing the aggregate of the product of the **Area fuel cost per ton** in the period and the **number of kilowatt-hours supplied from generation in the Area** in the period, and the product of the **residual cost per ton** in the period and **the number of kilowatt-hours imported into the Area** if any in the period by **the number of kilowatt-hours supplied in the Area** in the period; or

(ii) **the Area fuel cost per ton;**

whichever is the less.

(I) **"The Area"** means the Area of the Area Board taking the supply.

(J) **"The Area fuel cost per ton"** in any period shall be determined as follows: the total **cost of fuel consumed** in the period at all the Generating Board's stations in **the Area** shall be divided by the total number of tons of **fuel** so consumed and the cost per ton so obtained shall be multiplied by 11,000 and divided by the average gross thermal value of fuel so consumed expressed in British thermal units per pound.

(K) **"Fuel"** shall mean coal coke and oil fuels but shall not include atomic fuels.

(L) **"The cost of fuel consumed"** shall mean the sums expended for **fuel** consumed plus the cost of any transport, handling preparation or treatment incurred in connection with the delivery of the **fuel** to boiler hoppers or furnaces and in connection with the disposal of the products or residues of combustion, together with the proper proportion of salaries and wages and any contributions for pensions, superannuation and insurance of officers and servants attributable thereto and the amount of any rebate allowed by the suppliers from the price of heavy fuel oil delivered at the Generating Board's stations, such rebate being attributable only to a specific quantity of heavy fuel oil so delivered, less any sums received from the sale of any products or residues of combustion.

(M) **"The number of kilowatt-hours supplied from generation in the Area"** in any period means the number of kilowatt-hours (being kilowatt-hours generated by the combustion of **fuel**) sent out from all the stations of the Generating Board in **the Area** in the period or **the number of kilowatt-hours supplied in the Area** in the period whichever is the less.

(N) **"The number of kilowatt-hours supplied in the Area"** in any period shall mean the number of kilowatt-hours supplied in the period by the Generating Board to the relevant Area Board and to other consumers in **the Area.**

(O) **"The number of kilowatt-hours imported into the Area"** means the amount if any by which **the number of kilowatt-hours supplied in the Area** exceeds **the number of kilowatt-hours supplied from generation in the Area.**

(P) **"The residual cost per ton"** in any period shall mean the aggregate of:—

(i) The quotient produced by dividing the amount by which **the national fuel cost per ton** in the period multiplied by the aggregate of **the number of kilowatt-hours supplied in the Area** of each Area Board in the period exceeds the aggregate of the respective products in the case of each Area Board of (a) **the Area fuel cost per ton** in the period and (b) **the number of kilowatt-hours supplied from generation in the Area** in the period, by the aggregate of the **number of kilowatt-hours imported into the Area** of each Area Board in the period; and

(ii) the sum of 6s. (six shillings).

(Q) **"The national fuel cost per ton"** in any period shall be determined as follows: the total **cost of fuel consumed** in the period at all the Generating Board's stations shall be divided by the total number of tons of **fuel** so consumed and the cost per ton so obtained shall be multiplied by 11,000 and divided by the average gross thermal value of the **fuel** so consumed expressed in British thermal units per pound.

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the best insurance premium you ever paid

When you invest in an Ellison Circuit Breaker you are, in fact, paying a premium for long-term insurance—insurance against breakdown, disruption of production, increased costs, unfulfilled orders. A premium for complete protection of operator and plant and trouble-free service over the years.

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THURSDAY 19 OCTOBER, 1961
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ELECTRICAL TIMES

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Dans ce numéro

Balais en carbone pour machines électriques ... 555

On s'efforce actuellement d'approfondir les connaissances fondamentales quant à la commutation et la technologie des balais en carbone. L'on vise éventuellement à la classification des balais selon leurs caractéristiques fondamentales de fonctionnement. Des machines servant à examiner en laboratoire les paramètres nécessaires sont en cours de mise au point aussi bien qu'en usage. Un commutateur est soumis à des essais, et comporte des segments en acier sur lesquels des surfaces commutatrices en cuivre sont agglomérées.

Alimentation d'électricité au Canada 567

Parmi les mises au point effectuées l'an dernier dans le système d'alimentation de l'Ontario, Canada, des travaux préparatoires furent entrepris relativement à une ligne de transmission de 460 kV. Une station hydroélectrique a été mise en service et se sert d'une turbine dont de pas des ailettes est fixe, pour une charge aussi élevée que 28,3 mètres. L'étude d'un projet visant à accroître les intensités d'utilisation de câble en renfermant des câbles de 115 kV dans une conduite où circule de l'eau de refroidissement, a révélé que l'effort tranchant sur la gaine du câble peut être jusqu'à 30 fois plus élevé que pour un câble renfermé dans une conduite à refroidissement naturel.

L'électricité dans la fonderie 569

La production des pièces coulées en acier dans les fours électriques dans le Royaume-Uni dépasse 400.000 tonnes par an, et 630 millions de kWh environ sont utilisés. L'étude des fours opte pour deux types principaux de four à arc et deux types de four à induction. Les fours à arc sont du type oscillant indirect monophasé ou bien du type Heroult. Les fours à induction sont des types en 'U' et à haute fréquence. Un four à haute fréquence d'un type peu commun effectue et la fusion du métal et le coulage en coquille.

In dieser Nummer

Kohlebürsten für elektrische Maschinen 555

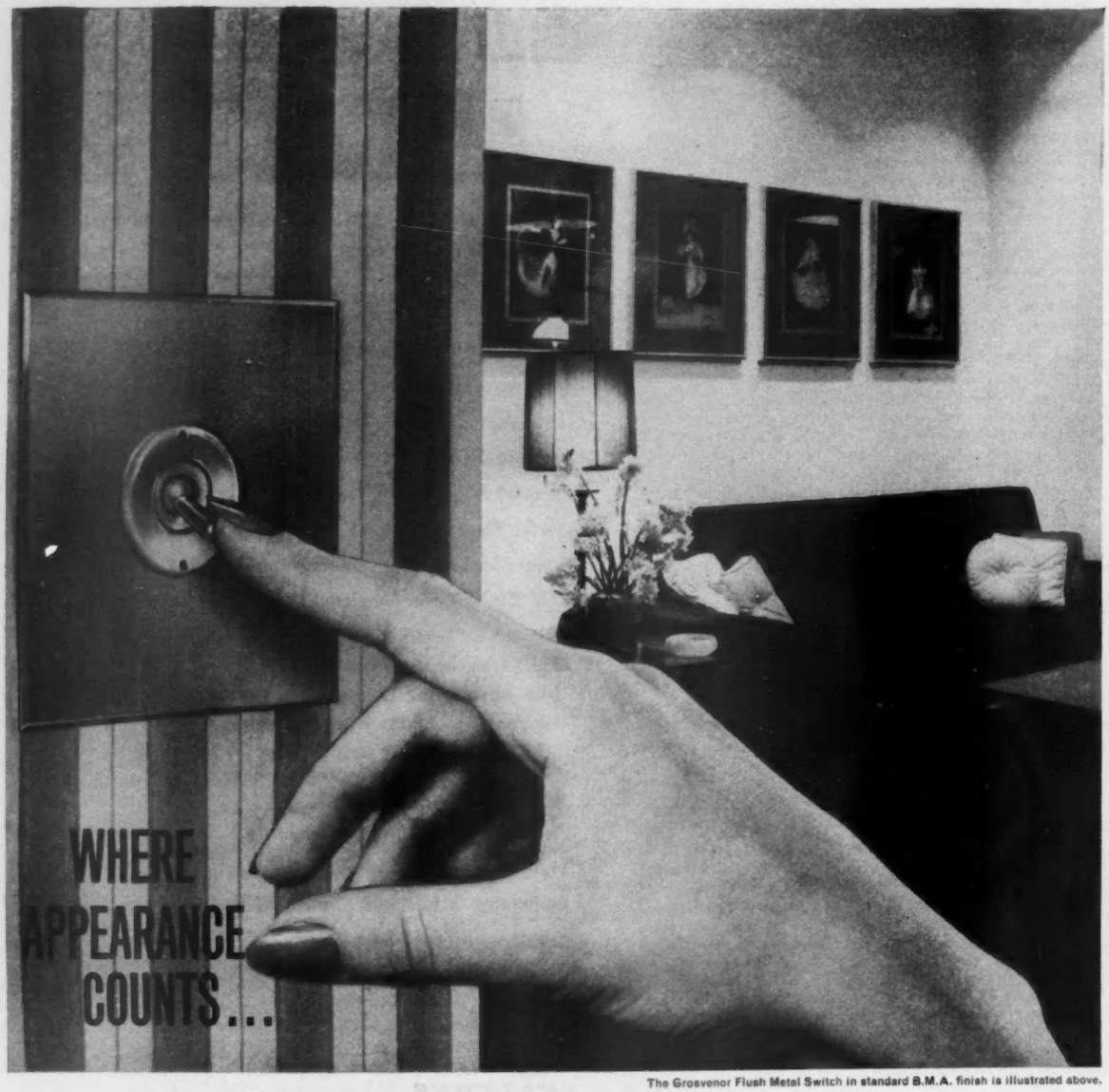
Es sind Versuche im Gang, eine bessere Kenntnis der Grundsätze der Kommutation und der Kohlebürstentechnologie zu erlangen. Man strebt dabei an, letzten Endes die Bürsten nach ihren grundlegenden Arbeitskennlinien einteilen zu können Maschinen, mit deren Hilfe man die betreffenden Parameter im Laboratorium untersuchen kann, sind gegenwärtig im Entwicklungsstadium oder schon im Gebrauch. Es sind auch Versuche mit einem Kollektor im Gange, der Stahlsegmente mit aufgesinterten Kommutationsoberflächen aus Kupfer besitzt.

Kraftversorgung in Kanada 567

Entwicklungen, die im vorigen Jahr im Elektrizitätssystem von Ontario (Kanada) stattgefunden haben, umfassten die Vorarbeiten für eine 460 kV Überlandleitung. Es wurde ein Wasserkraftwerk in Dienst gestellt, in dem eine Turbine mit unverstellbaren Schaufeln für eine bis auf 28,3m ansteigende Säule Verwendung findet. Das Ergebnis eines Projekts zur Steigerung von Kabelnennleistungen durch Verlegen von 115 kV Kabeln in einem Kühlwasser enthaltenden Rohr zeigte, dass die Schubbeanspruchung der Kabelumhüllung das Dreissigfache der bei einem in einem natürlich gekühlten Rohr laufenden Kabel auftretenden Schubbeanspruchung betragen kann.

Elektrizität in der Giesserei 569

Im Vereinigten Königreich übertrifft die Produktion von Stahlformgussstücken aus elektrischen Ofen 400 000 Tonnen pro Jahr, und es werden etwa 630 Millionen Kilowattstunden verbraucht. In der Ofenkonstruktion hat man sich jetzt auf zwei Haupttypen von Lichtbogenöfen und zwei Haupttypen von Induktionsöfen festgelegt. Bei Lichtbogenöfen ist entweder der einphasige indirekt geschaukelte Typ oder die Heroult-Konstruktion vertreten. Die Induktionsöfen sind entweder Rinnenöfen oder solche ohne Eisenkern. Ein ungewöhnlicher Ofentyp ohne Eisenkern erlaubt die Durchführung sowohl der Metallschmelzung als auch des Schalengusses.



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ELECTRICAL
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Comment

TOO GOOD TO BE TRUE?

Few people seem willing to believe the forecast of the Government's advisers that demand and supply for scientists and technologists should be in balance by 1965. There is still less inclination to accept any suggestion that there will be an excess of men and women trained to professional standard in the years following. All the technological experience of recent years has conditioned management to the idea of a continuing shortage. Yet in some respects the estimates now presented take into account this criticism. They are based on the idea that there is a saturation point for employment of scientists and engineers in a business, and that the leading firms in many industries have already reached that point. Current technical developments, such as automation, may consolidate this feature, by permitting transfer of professionally qualified employees from production control to research and development. One thing about which it is necessary to be quite clear is that there is no suggestion that there is no early end in sight to the shortage of technicians, as distinct from professionally trained staff. Moreover, there is known to be some unbalance over the scientific and technological specialities, and it may well be that electrical engineers will continue in short supply for longer than some others. A figure of 40 scientist or professional engineers per 1,000 employees in electrical engineering is reported as a widely accepted figure, and that is higher than for the great majority of other industries. To reach that figure is going to take more than four years. Although the limitation will come in part from delays in the expansion of the industry, and thus in the rate at which new highly qualified staff can be absorbed, it seems dangerous to base any plans on the idea of spare electrical manpower by 1965.

OUTDOOR CONSTRUCTION PAYING OFF?

A few years ago the question of cost savings possible by changing the type of building used for power stations was an urgent topic of debate. It was from across the Atlantic that many of those who argued for radical changes got their ideas. Now it seems likely that USA station designers may be facing a similar line of criticism. The twelfth in a biennial survey of steam power stations which our US contemporary *Electrical World* has recently published reports remarkably wide variations in cost/kW installed in 1959 and 1960. Completely outdoor stations were, on average, built for about two-thirds the cost of equivalent enclosed stations. In the capacity range 300 MW to 500 MW the price was closer, but still £34/kW against £46/kW. The figures need cautious interpretation because, where climate

favours outdoor construction, easy-to-handle natural gas is often available as the fuel choice. The dearest coal is burnt in relatively inclement New England, and so enclosure is accompanied by the higher capital costs associated with squeezing the last decimals of thermal efficiency from the plant. Fuel costs, even in that part of the USA, are attractive to British eyes, however—about 3d/therm, compared with the average of 4d/therm given in the last CEGB report. The US average is 2·3d/therm. Such factors clearly affect enclosure policy as well as other aspects of station design. Despite them, however, the best US station had a thermal efficiency of better than 38%, and the average of the new stations was 33%; compared with a best of 34·1% in the last top twenty list for CEGB stations. On the design side, two of the developing features of British designs are applying across the Atlantic as well. There are a substantial number of static exciters in use, and a strong trend to turbine-driven boiler feed pumps.

LEAKAGE UNDERGROUND

Current-balance earth-leakage protection has become a topic of controversy for those concerned with electrical installations. Underground in coal mines, it has for long been an accepted method—but it seems that in such situations there is equally room for development; and the same essential point is at issue—sensitivity. The Association of Mining Electrical and Mechanical Engineers strongly criticise present practice in a memorandum recently published. Their concern is that distribution systems underground allow a substantial current to flow to earth for the short period taken to clear a fault. That can be dangerous from the explosion viewpoint. The suggested change in practice is substitution of highly sensitive earth-leakage detection, and the proscription of distribution systems with solidly earthed neutrals. Insertion of a relatively high impedance between neutral point and earth seems to be envisaged, although this could have some serious dangers from the shock risk aspect. This development may not be unimportant in terms of the potential demand for current-balance mechanisms working in the milliamp differential range, even though the equipment controlled would be greatly dissimilar for the mining and the domestic applications. There is another development which the mining engineers are seeking which might have applications above ground. It is a relay sensitive to concentrations of explosive gas that would switch off the supply to an affected area once preset limits of concentration were passed. If such a detector could be made reliable, it might well have applications in some industries with explosion hazards to provide for.

TAILORING CARBON BRUSHES

Carbon brushes and rotating contacts are extremely old in electrical engineering. Perhaps because of that, their application has seemed to involve rather more empiricism and rather less numerical designing than is common in most sectors of electrical machine design (although one manufacturer at least uses a computer for this purpose). As the article that begins opposite shows, a determined effort is being made to alter this situation. The research effort into brush phenomena is being stepped up. Closer co-operation between brush maker, machine manufacturer and user seems in prospect, with quicker and more reliable experimental results following. The result to be worked for is a technique that will permit a brush to be designed for a stated electrical machine duty, in terms of the composition of the brush material and the size and shape of the brush itself. For success, this approach will have to be developed to the stage where machine designers are willing to accept the solution offered by the brush maker without awaiting the results of time-consuming field trials. That is a difficult target to achieve. It is likely to involve a lot of fundamental research into the details of copper/carbon conduction for, when all is said, surprisingly little seems to be known about this in microscopic terms. One of the oldest devices of the electrical engineer is not going to yield its mysteries to rationalism easily.

ARTICLE

"Article" is a useful word. It has that Alice-in-Wonderland quality that it can mean anything one likes, from an august contribution to these pages, to the lady's unmentionables in the play *Autumn Crocus*. Only in the GCE "O" level English is it given precision of meaning. Now the legal profession is taking a hand, and in two cases decided earlier this month it was held that water is an article but electricity is not. On such fundamental facts depend the compensation for an accident or the rates to be paid for a building. In the first case, the noble Lords were not sure whether water in its natural state was an article or not but, when impounded in a water works, it certainly was. Thus is left to posterity the decision whether water behind a hydro-electric dam is, or is not, an article. It is, however, the decision on electricity that must be our more serious concern since it has almost the element of defamation on our means of livelihood. The case concerned a television studio, and it was held that the 0·019 W television signal emitted did not justify derating as an industrial hereditament; such a signal was not an "article." Few power engineers would demur from such a judgment. Yet with coal gas already acknowledged in the House of Lords to be an article, we cannot afford to let electricity lag behind. If the electrical structure of matter were argued before an appellate court, surely the paradox between the two recent decisions would be disclosed, that electrical particles existing in their natural state in water molecules can be an article, yet when impounded within the confines of a co-axial cable, they are not.

Meteor

This week's quick summary of electrical news faces advertisement page 16

Rationalising the carbon brush

CONFERENCE REVIEWS USE AND POSSIBLE DEVELOPMENT

CONVERTING the art of carbon brush manufacture and application into a science is the declared intention of Morganite Carbon Ltd. Their first carbon brush conference was held in London last week and attended by more than 100 delegates from industry in this country and overseas. Twelve papers, presented by members of the company's staff, surveyed present knowledge and application of carbon brushes. These, with delegates' contributions, are eventually to be made available by the company.

An introductory paper by Mr A. E. Feaver outlined properties of carbon and its particular value for sliding contacts on electrical machines—good conduction, despite a resistance 600 times that of copper; retention of strength even at temperature of 1,200° C; and its high heat of vaporisation making it so resistant to the effects of arcing.

In the past, he said, no predictable link had appeared between processing of carbon and subsequent brush performance. It had not, in general, been found possible to reproduce working conditions in the laboratory and, in consequence, knowledge was based on correlated records of machine performance.

Field trials were, however, time-consuming and likely to impede rapid progress. It had therefore become necessary to develop evaluation methods useful both to the application engineer and the development chemist and physicist. In a later paper, Mr Feaver outlined applications for various types of brush holders for a.c. and d.c. machines. He referred to efforts being made to increase the time between brush changes on large turbo-alternators to above 12 months. Constant-force springs were now available for maintaining a steady brush pressure with wear, and a solution might be to increase brush length by 50% corresponding to an effective doubling of the life. However, a limitation might be the increased inertia of the longer brush. Investigations were being made by some machine builders.

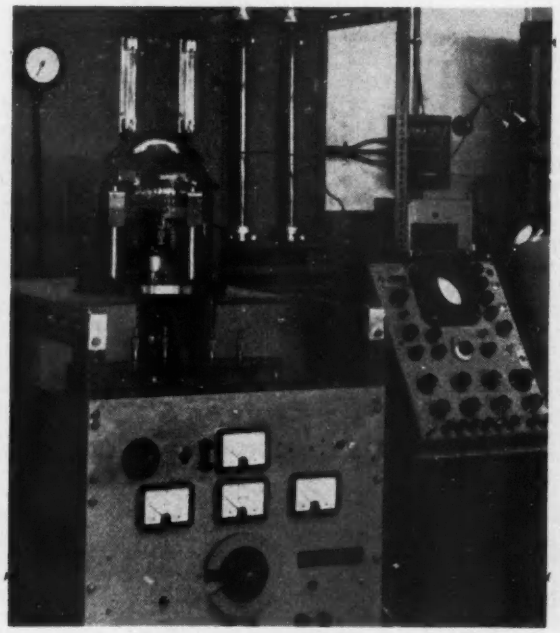


Fig. 1. A general view of the apparatus developed for examining performance of carbon brushes under controlled conditions. A vertical shaft carries the commutator disc, and the assembly is mounted in a sealed enclosure

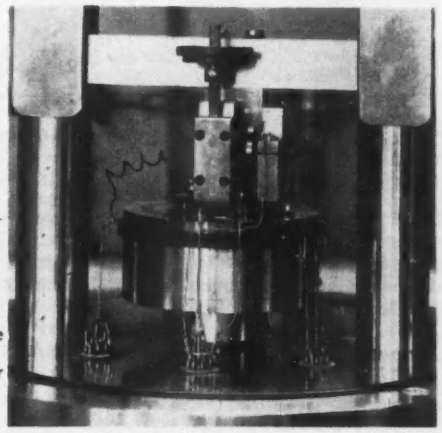


Fig. 2. The brush holder assembly and capacitor gauges on the laboratory equipment for measuring brush wear

Work on brushes was directed towards the ideal of being able to relate directly the constituents and methods of brush manufacture to performance under specified operating conditions, said Mr A. G. Conford. However, knowledge of the problems involved was at present only superficial and in the past progress had been based on empirical work by practical engineers, physicists and chemists.

Physical and electrical tests provided only the crudest guide to operation, for grades with the same resistance, strength and hardness might not be interchangeable in operation. Simple running tests were effective, but more important were laboratory tests on actual machines. However, even these tests only represented operation of a particular machine.

New test methods were planned to evaluate particular facets of brush behaviour; e.g., contact drop/current density or wear/pressure. More fundamental investigations were concerned with the influence of the brush in reducing reactive voltages in commutated coils and the brush ability to damp mechanical disturbances.

In a review of theories of the brush interface, Mr A. E. Stebbens concluded that the "contact spot" theory of operation—that the film formed on copper was broken down at localised points, thus forming small contact

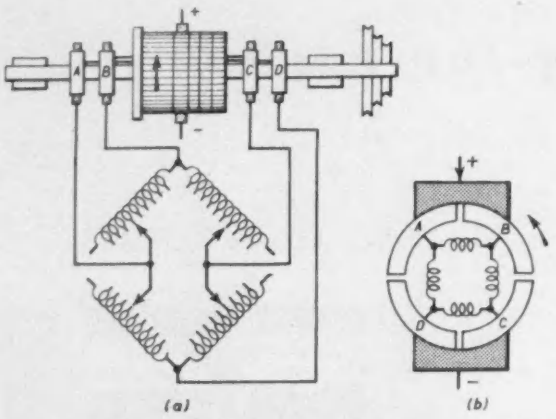


Fig. 3. Synthetic commutation machine with provision for inserting varying values of inductance into the commutated circuit. The equivalent arrangement of the machine is shown at (b)

bridges—almost explained observed facts. Further work was needed to show the exact function of the contact oxide film at the sliding interface, whether it behaved as an insulator to be broken down or as a semiconductor showing non-linear and rectifying properties. The effect of atmosphere had been largely neglected, but it might have an important influence on copper oxidation and therefore friction and wear processes.

In another paper he described apparatus for measuring the wear of carbon under controlled conditions and, in a tour of the laboratories, delegates were able to see some of the special equipment developed.

A machine has been designed in which the rotating assembly is as mechanically true and free from vibration as possible. It is enclosed, enabling it to run in a near-pure atmosphere, so eliminating as far as possible effects of varnish vapours, humidity and other factors known to influence brush performance.

The apparatus consists of a vertical shaft with a bearing limiting axial and radial play to 0·0002 in. at temperatures up to 150°C. A copper disc, used as the slip-ring, is clamped to a turntable on the shaft. The brush holder is suspended from a stout bridge with a mechanism which prevents tipping of the brush under friction forces. Maximum friction displacement is thereby restricted to about 2 microns. For measuring brush wear, which is only of the order of 1 micron/hr, a resonant bridge method is used which detects variations in capacitance between the slip-ring and an electrode mounted on the brush.

Brush Wear Variation

Among the effects noted so far is that, even under controlled conditions, brush wear rate may suffer short-term variations of up to 4:1. Wear rates in the controlled atmosphere were one-third to one-quarter of those with the equipment open to the laboratory. They became greater when solvents or other vapours were present and, on one occasion, it was found that wear rate increased 40 times due to vapour from a rubber gasket in the air supply.

Using the equipment to investigate commutation under the simplest conditions and after very careful preparation of the commutator, waveforms observed with inductances in circuit corresponded closely with those calculated from simple theory.

Three papers by Mr A. F. Watson dealt with "Interpretation of Contact Drop Characteristics," "Solid Viscosity and the Arc of Contact," and "Factors Influencing Brush Stability." Mechanisms involved in the conduction of electricity across the interface between brush and commutator or slip-ring were conduction by "a" spots; that is, the load-bearing area of a brush in direct contact with the conductive material; by processes analogous to those in a semiconductor through insulating films close to the "a" spots; by arcing, and by frittage carriers resulting from metallic migration. So complex a system defied quantitative analysis and required empirical treatment.

In considering reactance voltage, it was not good enough to assume a linear current rate of change nor that the reactance voltage of a machine was independent of the brush characteristic.

Rate of change of current was an important factor and, for a brush, the rate of decay of the rate-of-change-of-current was slower than for a resistance. This effect lessened the effectiveness of brush resistance in damping down coil current and therefore minimising the reactance voltage. Brushes were best rated by a factor which took into account the interface resistance and a factor "m" depending on current rate of change. For linear commutation and for a brush to wear well and uniformly, a uniform current density across its face was required. Any lack of compensation due to deficiencies in the interpole field form caused circulating currents in the commutated coil, superimposed on the normal average current density. The brush should reduce these by its interface resistance.

Brush interface resistance needed to be as high as possible to neutralise circulating currents caused by transformer voltages in a.c. machines. But too high a voltage drop caused sparking or arcing.

In his second paper, Mr Watson described methods for determining the internal solid viscosity of a material. High mechanical damping improved brush riding on the commutator, while flexural vibration reduced the effective arc of contact and hence modified the black band width.

Other papers presented concerned synthetic commutation machines for studying particular characteristics of brush behaviour and a review of possible development trends, see ELECTRICAL TIMES, 1 August, 1957. During the conference, delegates were able to inspect the research department and a products display. A recent development is a steel commutator segment with sintered copper commutating face. A commutator with this construction is undergoing trials. Also available at the conference was a revised edition of the 275-page book "Carbon Brushes and Electrical Machines."

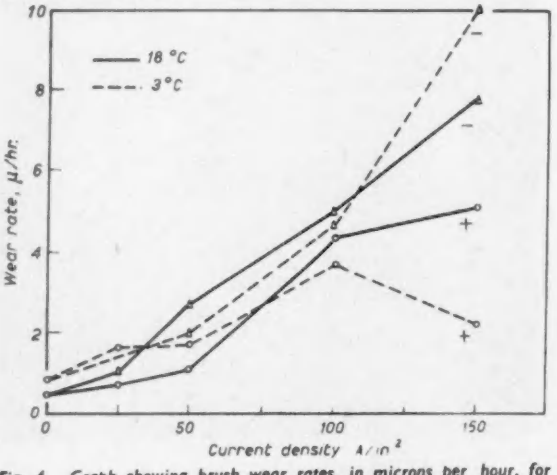


Fig. 4. Graph showing brush wear rates, in microns per hour, for varying current densities and in differing humidities

DISCUSSION

On the last morning of the conference a selection of questions previously submitted by delegates were considered.

In answer to questions by MR J. O. HAIRE (RTB), MR T. H. COOK outlined the uses of brush impregnants. All the five commonly used impregnants reduced brush friction and in fact this was why they were originally used. Up to 10½% mineral oil could be used for this purpose before exudation from the brush began to give sluggish movement. Paraffin wax was used, but excessive amounts with consequent exudation from the brushes could cause them to stick in holders. Improved life and brush strength were obtained by using vegetable oil, varnish or synthetic resin impregnants. Vegetable oil did not exude unless the brush was operated at an excessive temperature; synthetic resins had enabled brush strength to be increased by 50% to 100% and also eliminated most cases of brush breakage.

MR F. J. PEPWORTH (AEI, Manchester) observed that extensive measurements of contact drop in the factory gave results often differing considerably from figures quoted by brush manufacturers. Mr Cook replied that one reason for the discrepancy might be that contact drop figures were obtained on a solid contact ring with a steady current flowing, so that there was no question of commutation. Current density under the brush was constant and not subject to the variation between leading and trailing edges of the brush, as occurred in a normal machine under commutating conditions.

Asked whether the colour of the commutator film was a reliable guide to the machine condition, by MR A. HEENE (NV Cockerill-Ougree), MR A. F. WATSON (Morganite) answered that so many factors affected film colour of a running machine that in itself it would be an unreliable indication of commutating conditions. But in association with other factors it might well be significant. MR J. G. HEARD (EE) strongly supported the contention in Mr Stebbing's paper that mechanical imperfections of each experimental machine entered, in an unknown way, into the operational mechanism of the brush interface. New tools, such as the X-ray and electron microscope, were available to solve the brush problem, but he felt at times there was too much optimism about the use of these techniques. Current attempts to understand what happened at the brush interface were, he thought, analogous to trying to understand a novel by reading isolated words here and there. Eventually it would be necessary to do work with the electron microscope, for brush interface phenomena happened in microseconds. He suggested film conditioning took place not in hours or weeks, but in milliseconds. Subsequently, MR E. H. SJOKVIST (ASEA) described some work done on commutator film formation, in which the film thickness was estimated from its voltage puncture strength.

MR H. NEWSAM (AEI) asked for more information on spark puncture strength and the tests used to measure it. He said that while he had no wish to belittle the importance of improving brush life, he felt it far more important to take steps to prevent commutator deterioration. He asked if work was being done on limiting conditions causing commutator deterioration, particularly the incidence of "flatting," and to correlate such effects as current density, voltage across interface, peripheral speed and temperature. In reply, Mr Watson said that the synthetic commutating machine was being used to investigate spark puncture strength, but it was not possible as yet to give any results.

A most gratifying feature of the conference, MR F. K. EARP, technical director of Morganite Carbon, commented, were the many offers received from delegates of field evaluation facilities. These offers suggested that field trials could be mounted on a much larger scale than had been hitherto attempted and there was some possibility that co-operative trials between groups of industrial concerns might be exploited to the general benefit of the industry.

Industry had reached the stage when, in order to maintain the future of the d.c. machine, it was useless to spend time and trouble on the one aspect of commutation without giving attention to causes which might give continuous commutation trouble from the time the machine was designed, said MR E. P. HILL (formerly AEI).

It was important not to build into a machine features which would appear as brush trouble eventually. Basic design features—the electrical and magnetic balance, suppression of harmonics, avoidance of "lumpy" commutation, that is commutating huge masses of current, adequate equalisation—and many other factors had to be properly selected at the design stage. With these fundamentals given proper attention there would be no need to worry about particular brush grade. He emphasised the value of having an experienced man to act as liaison between the design and test departments, the customer and the brush manufacturer. In reply, Mr Cook said he could not express how grateful he was for Mr Hill's sentiments. In reply to a question on the best way to set brushes in the factory to give satisfactory performance in service, Mr Cook said that it depended largely on the design of machine. In the test department there were of course only a few points of brush contact on nearly clean commutator copper. Even after a few days the commutator skin was nothing like that obtained in normal service. However, the designer would presumably allow for reasonable black-band commutation and if the brushes were set in the middle of this band then, although there would be changes in the service, they should still remain inside this band. He added that in his experience, more machines were being sent out from the factory with the brushes correctly set than before the war.

In reply to a question on the use of spark detection meters, Mr Watson said a commercially available type was used by Morganite. These did not measure radiation intensity directly, but relied on some part of the machine circuit to resonate. In consequence, they had to be used with caution. For example, they did not give results which were a suitable basis for comparing different machine constructions.

To get the most out of the machine, said MR B. SKENFIELD (AEI, Rugby), brushes had to be used to their limit, but smooth commutation was necessary. Smooth commutation depended on many things, but essentially on a good armature winding. Up to about ten years ago it was known that certain windings would not work, but why they would not work was a mystery. Since then, the effects of commutation had been analysed. For a good machine, such refinements as the shape of the compole tip were, in his view, of little importance, but they did make a valuable contribution for improving performance of a machine in which it was necessary to use a poor winding. An important factor affecting machine design was the introduction of very rapid field reversal. Transformer voltages were produced under these conditions in a coil undergoing commutation and there was a case for some form of feedback control. Here also, high resistance brushes were absolutely essential. Emphasising the designers' dilemma in making a choice between first and running costs, MR J. DUNCAN (Bruce Peebles) went on to underline the difficulties of examining the exact mechanism at the brush-commutator interface. To make calculations, he said, it was necessary to adopt simplified assumptions for commutation, for the coil was shorted by a resistance of very dubious characteristics.

MR J. W. H. MORGAN (EE) said that the impression might have been given by the discussion that problems could be subdivided into those of the machine and those of the brush. This was not so. Such an idea also tended to confused thinking, that the designer required one property of the brushes and the user another. However, the designer must, ultimately, take responsibility for the field performance of his machine and select the appropriate brush to give required performance. Computers, he said, had a future for the circuit calculations involved in commutation. Already, after making certain assumptions, it was possible to calculate likely brush behaviour. More information was required on the dynamic performance of brushes and this was being sought. The next problem would be to determine a criterion of damage and whether this was dependent on voltage or energy loss. He suggested that if, in the early days, a scientific approach had been made to brush properties, there would not now be so many varieties.

Other speakers were DR H. VON BERTELE, who commented on copper picking of motor brushes fed from mercury-arc rectifiers, and DR F. T. BARWELL, who mentioned some problems in using carbon brushes for current collection from o.h. copper conductors.

Electrical Times, 19 October, 1961

Coal's future in generation

HYDRAULIC TRANSPORT TO LOWER TRANSPORT COST

FAIRLY bright prospects for the hydraulic transport of coal and improved methods of power station ash disposal were among the subjects referred to in the tenth Coal Science Lecture, presented by Mr L. Rotherham, M.SC., member for research and development, CEGB, when he addressed the British Coal Utilisation Research Association last week. By way of introduction to his lecture, "The Position of Coal in Electric Power Generation," he said that there were still many problems to be overcome in the use of coal.

Ten years ago coal was the only fuel which had to be considered, but by 1970 probably no more than 65% of coal equivalent consumed would be coal itself, as use of nuclear and oil increased; this figure being based on current estimates for power station building. Nuclear power, not competitive at present, might be by 1970, although this remained debatable. Electrical load growth was doubling every ten years but the number of kWh sold increased at a rather more rapid rate. In addition, slightly more rapid consumption occurred in the undesirable hours.

Coal *v.* Oil

In the battle of coal versus oil, a critical factor was the location of the coalfields, most of them remote from London, great power sink, and also from the rising demand on the south coast. Oil came into the country at certain specific points, and it was no coincidence that these corresponded closely with sites for nuclear power stations. In these localities, oil was competitive with coal.

Even if the costs of coal and oil were the same, coal contained large quantities of ash, constituting a great nuisance in power stations. In fact, Mr Rotherham said, he considered ash as the important difference between oil and coal as a fuel. He also added that he thought under certain circumstances nuclear power would be strictly competitive with coal. The one-time date for cost parity, 1965, had been pushed back by improvement in thermal station efficiency and the moderate increase in coal cost.

Although the price of coal from the best collieries was competitive with oil, transport charges were against it. Mr Rotherham showed with a graph that the annual charge/MW in £1,000's for transport over a distance of 120 miles was: for gas 4·2; rail 3·8; hydraulic transport 2·4; and high voltage 1·8 to 2·1, the value of 2·1 being for h.v. d.c. transmission. Pipeline transport of coal would clearly be cheaper than transport by rail.

Experiments on the hydraulic transport of coal were in progress at Croydon. Among the problems to be solved were the unknown properties of slurries and the pressure drops which would occur in long pipelines. Little was yet known about erosion in pipelines or about the best techniques for drying the coal when it arrived at the power station. Now under construction in Yorkshire was a 10 in. diameter main, 2,000 yd in length, as a further experiment stage. If this was successful it would be possible to consider direct transport from colliery to power station.

Turning to the problem of ash disposal, Mr Rotherham commented on the very severe problem caused by its deposition in the boiler tubes. Although some slags could be dislodged fairly easily, combustion of fuels containing sodium and calcium formed slags which were difficult to remove and extremely destructive to boiler parts. Studies were in progress on slagging conditions and one way being investigated to deal with the problem was to confine the ash in the furnace.

However, not all ash lodged in the boiler tubes, and the remainder had to be removed by collecting gear. Arresters cost in the region of £1/kW and, again, these were not necessary in oil-fired stations.

A considerable amount of work had been done on ash disposal and Mr Rotherham commented that very few industries had gone to as much trouble as the electricity supply industry to find ways of using this material which would otherwise have created eyesores. Recovered ash could be used for certain constructional work, for example, brick making, but these applications were strictly limited. The CEGB had tried to use ash dumped on waste land to render it agriculturally useful. Difficulties were the high concentration of toxic elements, particularly boron and molybdenum, the absence of humus and the small amounts of nitrogen and phosphorus compounds. Attempts had been made to leach out the impurities, with some success, if the ash could be dumped in, for example, water-filled gravel pits. Soil was not always necessary as a top dressing, some types of clover grew reasonably well on ash, and these varieties had the added advantage that the leaves of the first crops contained unusually high concentrations of the toxic elements. By destroying the leaves and ploughing in the roots, these elements could gradually be removed from the recovered ground. In the same way that some crops could be produced in the first few years of ash reconditioning, some animals could also graze on the crops without suffering harm.

Problems of Field Cycle

Considering some of the engineering problems involved in power stations, Mr Rotherham observed that it was often overlooked that higher efficiencies invariably meant increased cost, if the size of station was considered as remaining constant. This was because of the increased cost of special alloys such as the austenitic steels necessary for the advanced steam conditions required.

The best thermal efficiency for operation depended on the balance between capital cost and fuel cost. This was one reason why work was being pursued on the experimental Field cycle. One of the main problems to be overcome before this cycle could be exploited was the development of a p.f. fired superheater, and development had been carried out on a prototype for the last few years. For the Field cycle, pressures of 250 lb/sq in. and 1,382°F (750°C) could be compared with the design condition at Drakelow "C" of 1,100°F and 3,500 lb/sq in. However, it was a very different steam cycle to the conventional Rankine cycle and posed very different problems. It seemed probable that the capital cost would be only marginally less than the more conventional Rankine steam cycle.

Readers Views

Correspondents writing under pseudonyms are asked to submit their names and addresses in confidence to the Editor

Plugs for Appliances

I HAVE read with interest the suggestions of Mr J. W. Dronsfield, a committee member of the N.W. Electricity Consultative Council, under the heading "Fit Plugs to all Appliances" (ELECTRICAL TIMES, 5 October).

Mr A. O. Johnson, Chief Commercial Officer of the NWEB, has already pointed out the impracticability of fitting plug tops to all appliances before they are sold, because in the N.W. area not more than 20% of homes have been standardised. In my opinion, the average percentage over the country would be considerably less than 20%.

Looking from the manufacturer's point of view, the fitting of plug tops would unnecessarily enhance the price of the appliance to no effect. For instance, the fitting of a 13 A fused plug top, with the extra labour cost involved, would result in at least a 4s increase on the retail price. To this would have to be added a further 25%, plus 10% surcharge, on purchase tax. As it seems more than likely that the plug top would be the incorrect type for the consumer and would be thrown away, the only result attained would be a higher price to the consumer at a time when manufacturers are endeavouring to keep prices down, more especially with the Common Market competition on the horizon.

I am sure dealers would not welcome Mr Dronsfield's suggestion that they could exchange the plug top for the correct type. Would they be expected to do this free of charge; and would they have to refund the difference in value between the cost of the plug top fitted by the manufacturer and the new one fitted?

Our appliances exported to the Continent are fitted with plug tops because those countries have standardised to a much larger degree than this country, but until this situation exists here, Mr Dronsfield's suggestion is impracticable, desirable though his recommendation is.

R. F. Still,
DIRECTOR,
METWAY ELECTRICAL INDUSTRIES LTD.

Rewiring Flats

I WAS very interested to read *Megohm's* remarks on rewiring (5 October, 1961), especially his reference to blocks of flats, with which, owing to the type of construction, difficulties are going to be encountered when rewiring is necessary.

Surely we must move away from this old-fashioned idea of rewiring premises every 15 or 20 years, bearing in mind the high cost of materials and labour and the inconvenience of having to rewire.

If Pyrotenax m.i.c.c. cables had been used in the flats mentioned by *Megohm*, the need to rewire would not occur, as m.i.c.c. cable is non-ageing and, of course, provided it is installed properly, one would have a system which would last as long as the building and also completely fireproof.

The question of price is, of course, paramount as to whether one would use a p.v.c. system as opposed to m.i.c.c. cable. P.V.C. lighting and power cables for ring-circuits, etc., are cheaper, so therefore one can only compare the price of a good-class conduit system as opposed to an m.i.c.c. system.

The cost of installing a conduit wiring system, inclusive of labour, is approximately 17% higher than a system where m.i.c.c. pre-assembled cable units are used.

From experience, although conduit is supposed to be rewirable, difficulties can be, and are, encountered when rewiring is necessary.

J. D. Parker,
MYTCHETT, HANTS.

Appliance Earthing

HARDLY a week goes by before we read something about the old theme earthing. I have just purchased a well-known British make of cooker, and was very surprised when I found that the hot plates were not earthed. Further investigations found the reason why the plates were not efficiently earthed. The metal hob plate was earthed, but connection from hot plates to the hob was interrupted by the vitreous enamel. Effective earthing was impossible unless the enamel was filed clean so that the holding bracket of the hot plates could make good contact with the hob plate. The other alternative would be to bond all hot plates with an earth wire to the main earth terminal on the cooker.

One would have thought a manufacturer of repute would not have dared to put a cooker on the market which could be a danger to the public.

This model would not pass the BEAB test.

Arthur Dearden,
SALISBURY,
S. RHODESIA.

Care about Earthing

IN your issue of 21 September, *Megohm* referred to stick-on labels used by electrical contractors to indicate that estimates were based on the assumption that adequate earthing facilities are available, so that alternative or additional provision will involve extra charge.

Megohm may be interested to learn that this label is one of a pair on the same subject made available to ECA members. The clauses were, in fact, drafted some seven years ago, when it became obvious that the traditional means of earthing were not likely for much longer to provide adequate protection and, early this year, the general demand from the membership was sufficient for the label to be made available in the form of gummed slips to be attached to estimates or tenders.

As to *Megohm's* last inquiry, I cannot imagine that any contractor—whether in the private or public sector of the industry—can afford to assume that conditions will be such even in urban areas that earthing is possible without more than an earth clip on a water-pipe.

L. C. Penwill, C.B.E., COMPANION I.E.E.,
DIRECTOR, ELECTRICAL CONTRACTORS' ASSOCIATION,
LONDON W.C.1.

[*Megohm replies in his notes on page 563—Editor.*]

* * *

A CONVERSION of a house into three flats has provided us with a difficult earthing problem. The service intake has a four-wire overhead line and each flat (each on a separate floor) has a single-phase supply with 100 A cut-outs. The water supply is by 1¼ in. polythene underground service to a point in the house from which

it is continued by copper pipes. There is a hot-water heating system using small-bore pipes.

A separate earth-leakage circuit-breaker has been suggested for each flat, with the earth leads taken to electrodes spaced to prevent overlapping of the earth fields. A plastics section has been placed in the gas main to prevent connection to earth by that path. However, it seems that if a fault occurred on the ground floor flat, the consequent increase in potential might return via the water-pipes and possibly trip the circuit-breakers in the other flats. We have experienced such trouble in earlier installations after taking precautions with the earth electrodes. A solution being considered is use of a 100 A t.p. contactor with an earth trip between the fuse and the individual meters.

L. R. Drain,
W. Allfrey and Sons Ltd.,
Pulborough, Sussex.

* * *

IN reply to Mr Clarke (Readers' Views, 5 October), I am sorry my letter (14 September) did not specifically define the earth conductor as being the installation earth conductor. Obviously, if the metallic casing of plant or apparatus is not connected to an earth electrode (earth rods, water main, cable sheath, etc.) then in case of insulation failure to case no fault current can flow, and consequently there is no initiating current to operate any type of earth leakage circuit-breaker; and assuming the apparatus, as for instance a cooker, is installed upon a non-conducting floor, the casing of same under fault condition is at line voltage above earth.

Regarding the question of the minimum fault current necessary to operate a core-balance e.l.c.b., evidence indicates that very low operating currents are possible at the expense of high cost, complication and, in consequence, doubtful reliability. To keep the problem in true perspective, it is mainly one encountered in domestic and rural installations. In the first place any type of e.l.c.b. is installed, tested and then in most cases forgotten. Secondly, an electrical contractor has fulfilled requirements if the e.l.c.b. installed meets IEE Regulation 410, and the object of my letter of 14 September was to draw attention to the fact that with the core-balance e.l.c.b. made to comply with IEE Regulation 410, a lower value of earth electrode/conductor impedance is necessary than in the case of the conventional voltage-operated e.l.c.b.

The answer to the problem where it may be desirable to utilise a core-balance e.l.c.b. is the production of a reasonably cheap, reliable, robust (preferably monitored) unit.

C. H. Nicholson, M.I.E.E.,
Hull.

Adequate Wiring

I WAS extremely interested in reading the letter from Mr E. J. A. Francis on "Adequate Wiring" (12 October). I would like to assure Mr Francis that the NICEIC have in fact had several articles in farming journals already, including two or three in *British Farmer*, the journal of the National Farmers' Union, who are all on our side in our attempts to persuade farmers to use approved contractors enrolled with the National Inspection Council, who have voluntarily undertaken to work to the standard of the IEE Wiring Regulations. Unfortunately, the majority of farmers do not seem to absorb the quantity of good advice which is given to them, even if they read the articles at all.

Indeed, from our experience it is difficult to consider the farmers as blameless in the matter of poor and inadequate installations, as Mr Francis believes.

For example, the Ministry of Agriculture, Fisheries and Food have laid down as a requirement for any Government grant under the Farm Improvement Scheme or the Live Stock Rearing Land Improvement Scheme, that electrical installations shall be carried out in accordance with the IEE Wiring Regulations. This is fully explained to the farmers applying for Government grants, but like so many other things, it is honoured more in the breach than in the observance, and this will continue until the Ministry of Agriculture either employ sufficient inspectors themselves to go round and test the installations, or, what would really seem to be more simple, insist on the work being carried out by Approved Contractors of the National Inspection Council.

EDA, most electricity boards and ECC's, do their best to persuade farmers to put in installations of an adequate standard, but, as in the case of the "do it yourself" expert in the domestic field, educating the farming community to appreciate the importance of a really good installation is a slow and laborious business.

W. S. Thompson, O.B.E.,
Chief Executive Officer and Secretary, NICEIC,
London, W.C.2.

Shaver Sockets

YOU recently described (page 426, 21 September) a shaver socket as "the first unit made which is suitable for British, American and continental 5 A plugs used on electric razors." This claim seems difficult to reconcile with the patented introduction of the Chilton Universal Shaver Socket in 1952. It also needs to be noted that continental plugs concerned are, in fact, rated for 6 A and 10 A, and American practice is to have 15 A flat pin 110 V plugs.

In the writer's view the description "universal" is ambiguous when applied to any shaver socket which does not offer the alternative output voltage essential to many overseas visitors.

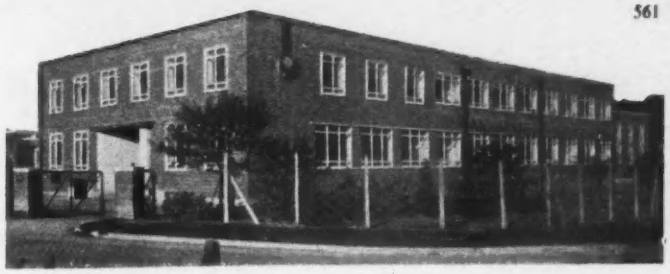
F. Holland,
Sales Manager, Domestic Division,
Chilton Electric Products Ltd.

Aluminium Conductor Ratings

RATINGS for aluminium conductors for overhead lines are given in ERA report O/T 26. The conductors concerned are aluminium, aluminium alloy and s.c.a. designs complying with BS 215, Pt 1; BS 3242 and BS 215, Pt 2, respectively. For each conductor, current ratings are given for a number of conductor temperature rises above ambient, for black or bright conductors, for conductors shielded from the sun or exposed to it, and for still air and for a wind speed of 1 m.p.h. The values were obtained by computation on a digital computer, and the programme used is given to facilitate calculation of other values, if required.

The basic formulae used are the same as those used in previous ERA work of this type. In certain cases, notably with s.c.a. conductors with an odd number of layers of aluminium, the current ratings may not be so accurate, the report warns, as substantial extrapolation was frequently needed. This extrapolation related particularly to a.c. resistance. When there is an even number of layers of aluminium, the a.c. resistance is reasonably near equal to the d.c. resistance, provided alternate layers of aluminium are spiralled in opposite directions.

E.D.A. Expands Testing House



THE work of the EDA testing house, which has grown continuously in the thirteen years since it started, has been given a new impetus by the needs of the British Electrical Approvals Board. Within this period the organisation has taken on tasks additional to the original objective of advising manufacturers; the preparation of the List of Recommended Appliances and the testing work for BSI being the better known. With these increasing responsibilities it has become necessary to expand the nine-year-old Leatherhead laboratories. This has been done by building a second storey on the original single-storey building, thus increasing the floor area to 13,969 sq ft. This provides three additional laboratories and a new photographic department has been built as an extension at the rear.

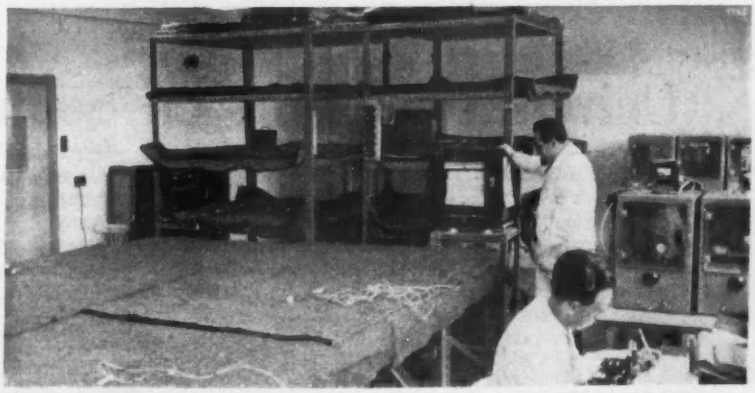
The principal laboratory is largely a repeat of the original portable apparatus unit with certain improvements. Fixed island benches provide all required supplies, either direct mains or through isolating transformers, with stabilised voltages also available. Along one wall are arranged the 24-way recorders for continuous temperature measurement, with leads permanently connected to each working point. These additional facilities have enabled the work of the testing house to be split into three groups for convenience, portable heating appliances, motor-operated equipment and a special section for large appliances.

One of the additional duties undertaken by the Testing House has been the testing of electric blankets for Kite mark approval. As this work has reached considerable proportions, a separate laboratory has been provided and, because of their similarity, electric carpets are grouped with them, as shown alongside. The characteristic feature of the room is the bunks, on which blankets are placed between felt pads for operation on over-voltage during endurance tests. In the centre of the room is a large island bench which can accommodate a 12 ft by 9 ft electric carpet or underlay. In addition there are a number of other benches large enough for other tests on electric blankets.

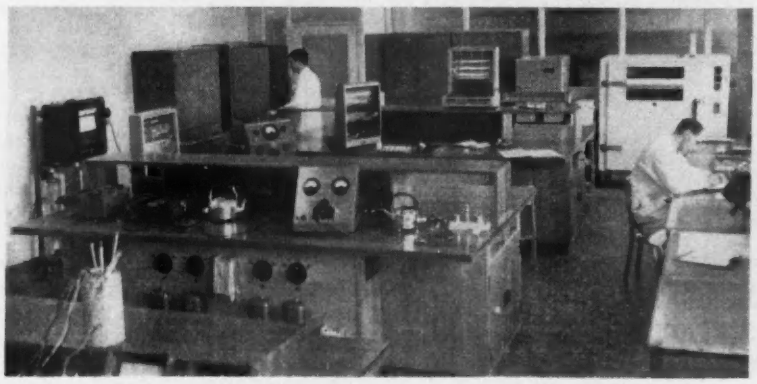
A smaller room in the new extension is devoted to the testing of components such as switches and thermostats. Most of the equipment is of the familiar mechanical type, but a change to pneumatic operation is taking place as this method provides greater flexibility of test rig. Quite a number of ingenious devices are used for automatic cycling during life tests on thermostats and heaters.

The photographic work of these laboratories is considerable since it is by photographs that the appliances are identified when approved. To meet these demands a new room 15 ft high has been built so as to permit the incorporation of a gallery to facilitate photographing from above. The lighting equipment is carried on a grid suspended from the ceiling. A new X-ray room has also been built within the section, which includes two dark rooms.

The extension to the Testing House has been equipped to provide flexibility. Steel partitioning provides for alteration in room size and both a.c. and d.c. mains are taken right round the building in trunking. In addition, a new temperature and humidity control room has been provided, particularly for refrigerators and water heaters. With this new extension, facilities are available for a further expansion of the work, which has grown from 230 appliances tested in 1954 to 568 in 1960.



▲ *Blankets and carpet underlays are tested in a special laboratory with bunks for over-voltage endurance tests*



◀ *All supplies are taken to island benches in the new portable heating appliances laboratory*

European Rural Electrification

RURAL electrification is a problem for electricity supply authorities everywhere. The difficulties and achievements of farm supplies in the UK are compared with those in other European countries in a recent report of the UN Economic Commission for Europe.*

The extent of development of rural systems, naturally, varies widely. Some countries, such as Czechoslovakia and Luxemburg, claim 100% connections, and Belgium, West Germany and Sweden are very near these figures. At the other extreme is Iceland with only 34% and Greece with 28·5% connections. British figures for the year were 78·8%, while the USSR reported 61% for collective farms, but higher figures for State farms and agricultural machinery stations. The UK had by far the highest reported electricity consumption/agricultural holding, but comparative figures in this category are somewhat sparse.

So far as power supply is concerned, connection to a general transmission system is usual, and even in Denmark the number of diesel stations for use on local networks is decreasing. In the USSR, rural hydro power stations supply power to rural consumers, many of these stations operating in local networks at voltages between 10 kV and 35 kV. Only automatic stations are now being built for this purpose. Distribution techniques involve widespread use of impregnated wood poles, which in the USSR are often mounted on a reinforced concrete base. Aluminium conductors with or without steel reinforcement and galvanised steel conductors are widely used. In Ireland, stranded steel conductors of 0·025 sq in. cross-section are used on lines of up to 10 kV and 2½ miles or less in length. Stranded aluminium conductors with cross-section between 0·078 sq in. and 0·168 sq in. have been used on l.v. networks in villages. Experiments with single-phase earth return lines have been reported from Ireland (10 kV) and the UK (11 kV).

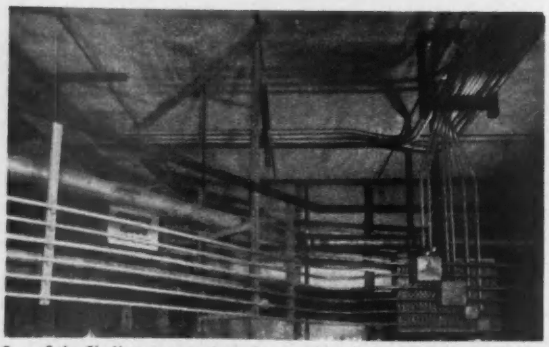
Techniques to improve reliability of supply include, besides the UK use of pole-mounted reclosing o.c.b's, the use in Sweden of remote control of circuit-breakers on rural networks by signals over telephone lines. This arrangement permits sectionalising of rural medium voltage lines to confine the effects of faults. In the USSR, self-regulating transformers with capacities between 20 kVA and 180 kVA are coming into use to improve voltage regulation. In East Germany there are plans to save costs by making wider use of transformer substations mounted on prestressed concrete poles.

The report discusses in general terms applications of electricity in agriculture which have increased in demand. The high cost of connection is a problem everywhere and in many countries State subsidies are given. Estimates of the average cost of connecting agricultural holdings range from the UK figure of $2,570 for isolated farms in the south of Scotland down to a Finnish statement of $290. The cost of connection is relatively small in countries where the degree of rural electrification is still low. The percentage of the cost of connection to be borne by the consumer is stated for many countries, with 80% for Italy being the highest and the free connection offered in Czechoslovakia coming at the other extreme.

* "The State of Rural Electrification in Europe in 1959," obtainable from HMSO, 5s.

Universal Supports on South Bank

EXTENSIVE use has been made in the new Shell centre, on the south bank of the River Thames, of "Unistrut" metal supports manufactured by Sankey Sheldon. "Unistrut" is a sheet metal beam in box section with one face slotted and the obverse face provided with fixing lugs. In the Shell centre, much of the "Unistrut" installation serves two functions. The building services are, in the main, installed in special service ducts and subways in the buildings and linking the two main blocks. False ceilings are extensively used with services carried in the underfloor space.



One of the Shell centre service subways which links the two main blocks. "Unistruts" are set in the underside of the roofing slabs and mounted vertically The pipe racks also carry the subway lighting installation

In the building stage, "Unistrut" was used in certain locations to support the shuttering before concrete pouring. For this purpose, a seal strip was inserted in the slotted face and to this was attached the shuttering. When the concrete had been poured and had set, shuttering and seal strip were removed, leaving the slotted face of the "Unistrut" flush with the concrete. Subsequently, trays and brackets for mounting the service cables and pipes were fixed in the "Unistrut" slots.

There are 30,000 lighting fittings, 250 telephone lines, with nearly 4,000 extensions, and over 22 miles of plastics pipes in the centre. These details give an idea of the scope of the services provided. Almost 100 miles of "Unistrut" were installed in the centre. They were set in the underside of every roof slab and, by a specially devised locating arrangement, in the subways linking the two main blocks of the centre, since in these subways it was not permissible to attach the supports directly to the walls.

By installing "Unistrut" extensively throughout the two buildings of the centre it has been possible to reduce the detailed planning necessary for the installation, since locating points for the building finishings were conveniently available throughout.

NOTES ON WIRING

BY MEGOHM

THE season of dinners and lunches, with their subsequent speeches, is now under way. These, as far as the electrical industry is concerned, are rather jovial affairs but, quite often, the speeches tend to put a damper on the high spirits of the guests by aiming very high in the particular sphere of the speaker. How refreshing it was, therefore, to have a speaker like Mr S. J. Emerson to listen to after an excellent lunch recently. Mr Emerson is, of course, HM Senior Electrical Inspector of Factories and, on this occasion, he spoke of his investigations into fatal electrical accidents, a subject which I have always thought worthy of attention. I have commented in the past on these and repeat that anyone who reads the official reports cannot help shuddering at what he reads.

Mr Emerson spoke of accidents and fires caused by electric blankets, the need to pull out the plug when blankets are not in use, the need to check these blankets regularly and to watch that they do not become damp by the spillage of water, or that late night cup of tea. I rather gathered that Mr Emerson did not really favour an electric blanket at all, but as they appear to be here to stay then we must do everything to make them safe.

Christmas decoration sets, fires in bathrooms, caravans and many other matters all came in for criticism regarding accidents. The dangers of imported appliances, not only because of the different colour coding of flexible cords, were explained at length and I thought this subject was particularly interesting because of the possibility of such articles being more readily available in this country. It was really pleasant to sit and listen to someone praising British goods instead of the usual remarks concerning the way that foreign manufacturers leave us behind.

Safety in the electrical industry is written and spoken about daily, yet there is ample evidence that most of this good advice is never digested. It is really amazing what the average person does with electrical apparatus. Most survive to tell the tale; some, as Mr Emerson points out, "join a heavenly club" where they congregate and discuss how they got there! The darker and colder evenings are almost with us and the electric fires and odd table lamps are now being brought into use, so let us all take heed of Mr Emerson's warning and check these appliances before it is too late.

Lighting Flexibles

The modern design trend towards closed or semi-closed lighting fittings is making its presence felt in more ways than one. The most important of these impacts being, in my opinion, the increased temperatures in and around such fittings, yet many electricians continue to use conventional flexibles. The use of ordinary flexible in such a situation is, of course, dangerous practice. This danger is not apparent to the ordinary person until something happens, such as a small fire.

One manufacturer has now brought on to the market high-temperature flexibles for use at 85°C, 130°C and 180°C. For the lowest stated temperature, the flexibles are insulated with a composite covering of varnished cambric and fibre asbestos and glass-fibre. The cable should be limited to dry situations due to the hygroscopic nature of the insulation. Cables for the higher temperatures are insulated with heat-resisting glass-fibre. Each conductor is lapped with two layers of glass-fibre which is impregnated with a suitable varnish. Standard colour coding is provided and I would like to see more use being made of this type of cable in domestic installations. To assume the *general* use of this type of cable is, I fear, expecting too much, and it is really up to the fittings and lamp manufacturers to assist by attaching a label to their wares. Certain of these manufacturers do so now, of course, although I have seen many instances where this warning has been completely ignored. There is no need for me to emphasise the danger of such "hot" situations.

Earthing Labels

The ECA have recently written referring to my remarks about the stick-on labels used by their members regarding the earthing of installations. Two such labels are available and the clauses were drafted some seven years ago when it became obvious that the traditional means of earthing were not likely to provide adequate protection for much longer. I do not intend to prolong this topic, but I would like to see *more* ECA members using these labels on their tenders in order to force the issue. The matter of earthing installations has dragged on for too long without somebody really laying down the law. Let us face up to the matter now and get a decision rather than drag on until chaos takes over.

Home Heating

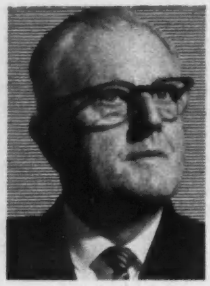
I have been rather perturbed by the recent advertising campaign on the heating of homes which alleges that electricity is the costliest means of doing this important job. Certain articles in the popular Press, however, have also pointed out the danger of letting heating contractors install piped "central heating" without first making allowances for heat losses, etc. One electrical manufacturer has marketed a storage heater for domestic installations, and I understand that quite a number of householders have had this storage system installed in their homes.

Apart from the fact that electricity has been "discredited" with regards to cost for heating, I am also interested in the overall effect of an increase in electrical heating systems. Are we, once again, going to suffer from a drop in voltage in our homes? Even with an "off-peak" system we are liable to have this, I think. Last winter I noticed it very much between about 6 p.m. and 10.30 p.m. If there is an increase in the use of electrical storage heating systems, the problem will get worse.

There are other problems, too, such as the weight of these heaters and, of course, the wiring to them. Some alteration is required at the intake position and, in fact, the householder may be faced with a major disturbance in his household. Perhaps some people will think that I am making mountains out of molehills, yet the matter of voltage drop is an important one, for we, as engineers, know that electrical apparatus is built to give full efficiency at the correct voltage.

Personalities *in the industry*

Mr R. Piper



Mr J. P. Tucker

Mr W. W. Grimes

Mr D. E. Castley

Mr F. Seeley

Mr Richard Piper, A.M.I.E.E., has been named as the new district commercial manager, Bristol South district of the South Western Electricity Board. He succeeds **Mr C. J. R. Blackett,** A.M.I.E.E., A.M.B.I.M., who was recently appointed manager of the Board's Exeter district (*ESH, page 100). Educated at Preston Grammar School and Preston Technical College, Mr Piper started with that town's Electricity Department, and continued with the North Western Electricity Board as sales engineer until 1950, when he joined the South Western Board as an agricultural show assistant. He was promoted to senior assistant engineer (commercial) Devon Group in 1951.

Previously an assistant to the group commercial manager, **Mr B. N. Lewis** has now been appointed a commercial manager in the Major Domestic Appliances group of Philips Electrical Ltd.

Mr H. E. Levy, B.SC.ENG., A.M.I.E.E., A.M.B.I.M., chief engineer of Foster Transformers Ltd., has been appointed to the board of the company. Born in Cologne, Mr Levy was educated there and later at the Forest School, Snaresbrook, and Northampton Engineering College, London University. He was chief electrical engineer of Brentford Transformers Ltd. from 1952 to 1955; he then joined Foster Transformers and became their chief engineer two years later.

Mr W. M. Primrose, A.H.W.C., A.M.I.E.E., is now district commercial engineer, Renfrew district, in the Clyde area of the South of Scotland Electricity Board (*ESH, page 166).

Under the reconstitution of the board of Submarine Cables Ltd. (which is jointly owned by AEI and BICC), **Mr D. T. Hollingsworth,** an executive director of BICC, has been appointed a director of Submarine Cables Ltd. Three new executive directors for the latter company, responsible to the existing managing director, **Mr F. W. H. Shaw,** have also been appointed. They are: **Mr C. L. G. Fairfield,** commercial director, **Mr G. H. Foot,** chief engineer, and **Mr S. J. Wilson,** works director. The Engineering Division of the Telegraph Construction and Maintenance Co. has been absorbed into the company and its products will be continued.

Mr G. Yem has become a director of Lightfoot Refrigerator Co. Ltd.

Manager of the Lincolnshire sub-area of the East Midlands Electricity Board since 1948, **Mr J. P. Tucker,** D.L.C., M.I.E.E., is to retire on 30 Nov. He will be succeeded by **Mr W. W. Grimes,** M.I.E.E., A.M.I.MECH.E., the present deputy sub-area manager, and the latter position will be assumed, on 1 Dec., by **Mr D. E. Castley,** ASSOCIATE I.E.E., who is now manager of the Board's Stamford district (*ESH, pages 114-115). Mr Tucker entered the electricity supply industry in 1923 as a district engineer (operation) with the Yorkshire Electric Power Co., after completing his education at Loughborough College. He later became district engineer and sales engineer before taking up the post of engineer and secretary to the Isle of Man Electricity Board in 1933. Three years later he was appointed borough electrical engineer and manager at Loughborough, a position he held till vesting date, when he became manager of the Lincoln district of the Board. His successor, Mr Grimes, joined the West Ham undertaking in 1928, serving there for 13 years in various positions, ultimately as assistant district mains superintendent. In 1941 he was appointed senior technical assistant to the Chesterfield Corporation Electricity Dept., and two years later was promoted to engineer and manager of that undertaking, a position he retained until vesting date when he became manager of the Board's Chesterfield district. He took up a similar post at Lincoln in July, 1958, and assumed his present post in April, 1961. Mr Castley was educated at the King Edward VI School, Norwich, and joined the Norwich Corporation Electricity Dept. in 1926, serving there for 11 years. He then had a similar period with the Mid-Lincolnshire Electric Supply Co., becoming district engineer at Grantham and Bourne prior to his appointment as area engineer in 1944. He has been manager of the Stamford district since 1948.

Previously with AEI, **Mr F. Seeley** has joined the Semiconductor Division of Mullard Ltd. as sales manager and will be immediately responsible to the Division's commercial manager. Mr Seeley has been in electronics for 17 years.

Mr Vernon Stott, managing director of James Stott and Co. (Engineers) Ltd. has been elected to the board of Glover and Main Ltd., the parent company.

Mr C. E. H. Eckersley has relinquished his executive duties as sales director of Davidson and Co., but continues his association with the company as a member of the board of directors, and in a consultative capacity. **Mr W. R. Magowan,** general sales manager, has been appointed sales director.

Mr J. Coward, M.I.E.E., assistant generation engineer at the North of Scotland Hydro-Electric Board's Tummel Valley group of power stations, has been appointed generation engineer in charge of the Board's Conon Valley and Affric group. He succeeds **Mr J. S. Oliver,** M.B.E., M.I.E.E., who has retired (*ESH, page 174). He started his career in the Burnley Corporation Electricity Department and later became a technical instructor with the Burnley Education Department. During the war he was attached to the Admiralty Signal Establishment of the DSIR. After service with

**Denotes revision to the "Electricity Supply Handbook, 1961."*

the North Western Division of the British Electricity Authority he joined the Hydro-Electric Board's staff in 1951 as third assistant engineer (protection and technical) and in 1955 was transferred to the Tummel Valley generating group.

At present senior assistant engineer (commercial) in the Essex sub-area, **Mr A. E. Somers,** A.M.I.E.E., has been appointed manager of the Edmonton district, Northmet sub-area of the Eastern Electricity Board. He succeeds **Mr C. A. Baker,** B.SC.(ENG.), M.I.E.E., who retires in December (*ESH, page 110). Mr Somers received his technical education at the Borough and Northampton Polytechnics in London and served an electrical engineering apprenticeship with the Ilford Borough Council Electricity Department. He became a junior mains assistant and later was appointed an assistant engineer with the County of London Electric Supply Co. Ltd. After service in the Royal Navy, Mr Somers was appointed second assistant engineer at Hornchurch and later became the first assistant district engineer at Romford. After nationalisation he was district engineer at Brentwood. For five years he was second assistant engineer (planning) at Essex sub-area and was later appointed second assistant engineer (commercial).

Mr G. P. Bache, younger brother of the company's chairman, has been appointed to the board of Geo. Salter and Co. Ltd., to take charge of the firm's manufacturing interests overseas.

Mr D. H. Maxwell, sales manager of the Transmission Division of the Telephone Manufacturing Co., is now on a six-week tour of the Middle and Far East.

Dr D. A. Bell, B.A., PH.D., F.PHYS.S., has joined AMF Ltd. as director of their new research laboratory at Peppard, near Henley-on-Thames. For the past 12 years he has been on the staff of the Electrical Engineering Dept. of the University of Birmingham. An authority on automation, computers and information theory, in 1949 he was appointed to a senior lectureship and has since held a number of important departmental positions, most recently as supervisor of graduate courses. For 14 years prior to going to Birmingham University he was engaged on industrial research, specialising in radio and telecommunications systems. He is also author of books and papers on specialised aspects of electricity and electronics, automation and research management.

Managing director of MTE Control Gear Ltd., **Mr W. H. Holmes** is to leave London Airport on 6 Nov. on an extensive tour of Commonwealth countries, including New Zealand and Canada. His discussions will include plans for manufacturing MTE components under licence in some countries, and the appointment of new or additional agents and distributors in others.

Mr J. J. James, founder and chairman of the Broadmead radio and TV group of companies, is resigning on 31 Dec. from the board and also from the board of Firth Cleveland, who acquired Broadmead nearly two years ago. This is the result, according to Mr James, of a wide divergence of views between the chairman, **Mr C. Hayward,** and himself. Firth Cleveland subsequently announced that Mr Hayward will take over as chairman, and **Mr J. Sorrel** as managing director of Broadmead.

Vice-President of AEI (Canada) Ltd., **Mr R. P. Horlock,** B.SC.(ENG.), A.C.G.I., M.I.E.E., M.E.I.C., has now been designated manager, North American area, for AEI Export. He is based in London but retains his position on the board of the Canadian company. Mr Horlock joined M-V at Trafford Park as a college apprentice in 1928 and after subsequent experience in the Plant Sales Department took charge of the Leeds sub-office in 1941 and six years later became manager of the Sheffield district office. He went out to Canada as manager of the M-V Export Co. in 1954, and when integration took place he became manager of AEI (Canada) Ltd. with headquarters in Toronto. He was also overseas representative in Ontario for the IEE.

At present senior assistant engineer (distribution design) in the No. 2 (Huddersfield) sub-area of the Yorkshire Electricity Board, **Mr G. R. Walker,** A.M.I.E.E., has been appointed assistant chief engineer (distribution system planning) to the North Eastern Electricity Board as from 1 Nov. He succeeds **Mr G. S. Lisle,** M.I.E.E., who is retiring (*ESH, page 149). Mr Walker began as a student apprentice with Croydon Corporation in 1937, and after war service became a junior engineer in the Croydon district of the South Eastern Electricity Board. In January, 1949, he joined the Eastern Board as third assistant district engineer at Romford and two years later was appointed first assistant district engineer, Goole district, Yorkshire Electricity Board. After a period in the Chief Engineer's Department he took up his present post in the Huddersfield sub-area in 1956.

The IES Gold Medal being presented to Mr H. C. Weston, left, by the retiring president of the Illuminating Engineering Society, Dr W. S. Stiles, last week

Formerly export manager, **Mr R. Chaffey** has been appointed deputy commercial manager of Marconi Instruments Ltd. He joined that firm in 1940 and subsequently served in Production and Installations Departments. After three years as a technical sales representative he transferred to the Instrumentation Export Division, and in 1954 was seconded to the Canadian Marconi Co. as head of that company's Instrumentation Sales Department. He returned to this country in 1958 as export manager, since when he has travelled extensively.

Black and Decker Ltd. announce the appointment of **Mr J. C. Brooman,** F.C.A., as export sales director, and **Mr E. A. King,** A.C.A., as financial director. In addition, **Mr J. H. Longland** has been promoted to sales manager in the UK and **Mr R. K. Symmons** becomes marketing manager. Mr Brooman had held the latter position since 1960, following management posts in production, financial and sales divisions, having joined

Mr A. E. Somers

Dr D. A. Bell

Mr G. R. Walker

Mr R. Chaffey

the company's Accounts Division in 1952. Mr King joined the firm in 1954 as assistant accountant, and has been financial controller since 1960. Mr Longland has been with Black and Decker since 1938, apart from war service, and has held a number of senior sales management positions since 1955, most recently as regional manager, London. Mr Symmons joined the company in 1952 on a three-year management training scheme. He then became sales administration manager and subsequently held increasingly responsible positions in the Marketing Division.

Mr P. V. Lister has been appointed assistant to the commercial director of AEI (Woolwich) in succession to Mr E. M. Whitaker. Mr Lister joined Edison Swan Electric Co. in 1949 and two years later took charge of the Sales Planning Department. In 1959, after the merger of Edison Swan with Siemens Brothers to form Siemens Edison Swan, he became responsible for sales of valves and c.r.t.'s to television and radio set makers. In January, 1960, he became sales manager of the newly formed AEI Radio and Electronic Components Division, and subsequently was appointed commercial manager.

Five new appointments are announced by AEI-Hotpoint Ltd.: **Mr M. Byrd** becomes design manager, automatic washing machines; **Mr R. Hammond** is design manager, semi-automatic washing machines; **Mr R. Morris** is now design manager, vacuum cleaners; **Mr P. W. Hoskin,** formerly internal auditor, has been promoted to management accountant, and **Mr D. A. Thompson,** previously with J. Lyons and Co., has joined the company as financial accountant. Mr Byrd joined the firm in August, 1957, as home laundry engineer and later joined a design team working on automatic washing machines. Mr Hammond started with Hotpoint in 1959 as a design engineer, refrigeration, and became design manager, processing and compressors, last February. Mr Morris, who has been with Hotpoint since last February as a senior design engineer, home laundry, was earlier design manager of the Domestic Appliance Division of Phoenix Telephone and Electric Co.

Kerry's (Gt. Britain) Ltd. announce the appointment of **Mr P. E. Jordan** as general manager of their northern sales division.

Mr A. B. Brown has been appointed a director of James Scott and Co. (Electrical Engineers) Ltd.

Following the acquisition by Faulkner Greene and Co. of all the capital of Phoenix Electrical Co. (London) Ltd., **Mr R. H. Huff** and **Mr S. G. Bridgen** (of Phoenix) have been appointed additional directors of Faulkner Greene and Co. **Mr H. Bart-Smith** and **Mr L. F. E. Rooks** (chairman and managing director, respectively, of the latter concern) have been appointed to the Phoenix board.

Dr Robert E. King, M.SC., PH.D., has been appointed lecturer in electrical engineering at Queen's University, Belfast.

Mr R. J. Fothergill, B.SC., A.M.I.E.E., has joined the Artic Fuse and Electrical Manufacturing Co. Ltd., as general and technical manager.

Deputy station superintendent at Stourport "A" and "B" power stations, Midlands Region, CEGB, since 1950, **Mr C. J. McChesney,** A.M.I.E.E., is being promoted to station superintendent there, to succeed **Mr G. E. C. Attwood,** who retires in December (*ESH, page 67).

Formerly chief accountant and secretary, **Mr W. I. Neilson** has been elected to the board of directors of Lumenated Ceilings Ltd.

Mr S. Raybould, M.I.E.E., is to be the new manager of the Worcestershire area of the Midlands Electricity Board. He will succeed **Mr R. Mallet,** B.A., M.I.E.E., who, as we have already reported, becomes chief engineer on 1 Jan., next (*ESH, pages 126/7). Mr Raybould has been manager of the Board's Central Gloucestershire area since May, 1955. Educated at the Bridge Trust Grammar School, Birmingham, and the Chance Technical College, Smethwick, he became a student apprentice with the Shropshire, Worcestershire and Staffordshire Electric Power Co. From 1935 to 1943 he was the company's chief transmission and distribution operation engineer, and then became technical assistant to the general manager, Mr D. H. Kendon. In 1945 he was appointed district manager at Dudley, becoming Northern Divisional engineer in 1948 shortly before nationalisation. He subsequently became deputy manager of the West Bromwich district, and district manager in 1949. In 1953 he went to Wednesbury district as manager, and in May, 1955 became manager of the Central Gloucestershire Area.

Mr E. E. Webster has been appointed general manager of the Plessey Co. Ltd., Swindon region. He joined the company in 1950 as chief inspector and subsequently became divisional manager, Capacitors and Resistors Division. Since 1959 he has been management executive responsible to Mr A. E. Underwood for production operations of the company and its subsidiaries in the Swindon region.

Appointed assistant superintendent, X-ray Department, at the Motherwell Works of Associated Electrical Industries Ltd. is **Mr N. R. Livesley,** who started with M-V at Trafford Park in 1924, and transferred to Motherwell in 1950. He has latterly been general foreman of the X-ray Department.

Previously generation engineer, Southern group, with the Western Division, **Mr A. G. R. Bell,** A.M.I.E.E., A.M.I.MECH.E., has joined the Southern Division, CEGB as Divisional generation services engineer (*ESH, pages 61/2). Prior to joining the former South Western Division in 1955, he had been station superintendent at the Bromborough power station for five years, after holding a similar post at Wallasey power station from 1948.

OBITUARY

Mr E. G. Holberry, M.I.MECH.E., M.I.P.E., works director of the EMB Co. Ltd., West Bromwich, since 1958, died on 1 October, aged 51. Earlier he had been works manager to Wilkins and Mitchell.

Mr Edward R. Speed, ASSOCIATE I.E.E., manufacturers' agent, of Clapton, E.5, died on 12 Oct.

NEW LITERATURE

Guide to the Repair of Printed Board Assemblies

PRINTED circuits are used increasingly in electronics equipment, and as life extends, it becomes more and more likely that some components connected to the circuits will require replacement. Although the procedure with single components is reasonably straightforward, removal and replacement of components with multiple connections, such as valveholders and multi-winding transformers is less obvious. The present booklet is one of the first publications to devote extended treatment to this and associated topics. Essentially practical in approach, it describes with the aid of diagrams the steps to be taken in repair and modification operations, and gives general advice on maintaining printed boards in serviceable condition. Published by the Electronic Engineering Association. 13 pages, 8¼ in. by 5¼ in. Price 3s.

Electrical Contractors' Year Book 1961-62

WITHOUT any radical change from its predecessor, this year's edition continues the ever-useful information concerning the membership of the ECA and the respective sections and branches. There is also a small folded map which roughly indicates the boundaries of those sections and branches. Otherwise the material falls into the usual pattern, providing quick reference to any ECA member in a specific locality. There follows notes on the law for electrical contractors, agreements, wage rates and working conditions. Published by Electrical Contractors' Association. 734 pages, 7½ in. by 4¾ in. Price 25s.

Ontario plans for 460 kV

TREND TO THERMAL GENERATION CONTINUES

OPERATING a system with a peak generating capacity that stood at 6,526 MW in December last, the Hydro-Electric Power Commission of Ontario meets with problems comparable with those of European interconnected generating undertakings. That adds to the interest of its always well-illustrated annual report, the 1960 edition of which reached us recently.

For Canada, 1960 stood in contrast electrically to the same supply period for the UK. It produced the smallest increase in energy sales since 1949 (3·7%). That affected the Commission's finances, but not its technical programme.

Ontario Hydro operates a combined thermal and hydro system which poses involved problems of economic loading. During 1960, the final stages of preparation were completed for introduction of a Univac II electronic computer to prepare daily loading schedules for all major power sources. These schedules take into account such diverse factors as thermal and hydraulic efficiencies, transmission losses, power purchase commitments and revenue from bulk supplies.

Trend to Thermal

At the end of 1960, thermal stations represented 17% of the total capacity of the Commission (i.e., 996 MW). During the year, they were responsible for generation of only 200 million kWh out of 31,500 million kWh total. This small proportion is accounted for in part by favourable hydraulic conditions, and a sharp rise is expected. The current development programme calls for installation of 2,720 MW of thermal plant by 1964 (including 220 MW nuclear) and 568 MW hydro by 1966.

Amongst stations in the programme is Lakeview, near Toronto, where four 300 MW sets are planned, with a possibility of two more. The nuclear programme comprises a 20 MW prototype installation on the Ottawa River, and plans for 1964 commissioning of a single-generator 200 MW station at Douglas Point, on the shore of Lake Huron, between Kincardine and Port Elgin. This will use natural uranium as the fuel and heavy water as the moderator. The station will be purchased by Ontario Hydro from the national atomic energy authority (Atomic Energy of Canada Ltd.) at a price which will permit the output of the station to be competitive with a conventional thermal station of the same size.

Amongst the hydro stations in the programme, the Red Rock Falls station on the Mississagi River is notable for its use of fixed-blade propeller turbines driving the 20 MW generators. The station has a rated head of 93 ft, and the decision to use this type of turbine was based on the evidence of a number of model tests. The report remarks that new designs developed for such units during the past decade give promise of good performance and resistance to cavitation at rated heads 50% greater than would have been considered for this type of turbine ten years ago.

Also at Red Rock Falls, the Commission is for the first time using a new type of electro-hydraulic governor instead of a mechanical governor. Ease of adjustment for optimum settings is claimed, especially for units and stations under automatic frequency control.

Transmission line developments include survey work for a 460 kV line which will run some 228 miles from northern Ontario. Included in the designs submitted for towers are guyed aluminium, guyed steel, tubular steel and laminated wood structures, as well as conventional self-supporting steel. The Commission itself has developed a new technique to overcome costly problems in tower foundation construction in some of the difficult country through which the line will pass. It involves pre-loading before backfilling the expansion anchors in which guys terminate.

Research and Testing

HV transmission has been investigated at the Commission's Coldwater test station, where work has continued on four-conductor bundles for the 460 kV line. Methods have been devised for relating line corona loss to actual precipitation, so that losses for any annual precipitation can now be determined. Interpretation of the radio interference data obtained suggests that conductors of a given size can be operated at voltages 20% higher than those previously considered to be the tolerable maxima, without exceeding acceptable r.i. levels.

The Commission has shown much interest in cooling systems for underground cables. Polyethylene pipes carrying water have been installed close to 115 kV cable circuits. Now an improvement is suggested in which the three cables of a circuit are enclosed in a single water-carrying pipe. Tests have indicated that this arrangement may impose on the cable sheath shear strains 30 times greater than for a naturally cooled ducted cable system; but they are still less than half the lowest value of strain likely to cause fatigue failure.

An essentially Canadian development project has led to production of a portable battery-operated device for measuring the load-carrying capacity of an ice sheet. Ice cores for checking in the apparatus are obtained with an electrically powered drill which can be operated from a car battery. The meter scale shows quickly and conveniently whether a given vehicle may operate safely on the ice cover available.

A new test facility is a point on the transmission system where operating experience with h.v. circuit-breakers can be tested without hazard to the system.

During the year, a method of economising in time and saving transport charges involved in the repair of large transformers was demonstrated. Mobile cranes were used to remove the core of the transformer and the winding assembly. A temporary scaffolding with a tarpaulin cover then protected the unit while the necessary maintenance work was carried out on site. This procedure has made possible on-site repair in several cases.

Changes in Electricity Underground

CHANGES in engineering practice regarding the use of electricity in mines is recommended in a memorandum issued by the technical committee of the Association of Mining Electrical and Mechanical Engineers. Taking the form of comment on the recommendations of the Bryan report on mining explosions, the memorandum affects both the design of mining electrical equipment and the manner of its use.

Damage to Plant

One of the problems faced is that of danger of explosion of firedamp if FLP electrical enclosures become damaged. The AMEME consider that there is no electrical equipment available that could guard against incendive sparking in these circumstances. They recommend that to deal with the danger, automatic gas detectors should be developed, and arranged to switch off the electric power in any section of the mine where gas concentration rose above a safe level. As a further precaution against mechanical damage to electrical equipment, more opportunity for electrical staff to have a say in its siting is asked for.

The original report placed too little emphasis on the danger resulting from damaged trailing cables, the committee think. They ask for individual screening of all trailing cables and the design and development of mechanical aids for handling trailing cables.

Protection

Earth-leakage and overload protection receive extended attention in the memorandum. The AMEME think that the high fault currents that can flow to earth before a fault is cleared constitute a serious danger. They ask for impedance earthing of the neutral point in all mine distribution systems, and introduction of earth-leakage protection sensitive to fault currents of a few milliamps. So far as overload protection is concerned, the feeling is that many failures arise from the use of incorrect fluids in the inverse-time dashpot. Use of a standard fluid could help in that respect.

Agreeing that the practice of searching for faults while circuits are live should be condemned, the AMEME committee suggest that the testing equipment available for use by mines electricians leaves much to be desired. They think it a matter of some urgency that there should be more collaboration between user and manufacturer to produce better equipment.

Management Attitude

Other matters dealt with in the memorandum include ventilation, the use of twin-core figure-of-eight shot-firing cables, standards of electrical practice, coal dust explosions, and human factors in electrical safety. With regard to maintenance, there is a statement that "the higher standard required would sometimes be facilitated by a more sympathetic understanding on the part of management officials" in respect of interference with production.

Third Factory for Magicoal

EXPANSION of Berry's Electric Ltd. has led to the building of a third factory at Bletchley, which was officially opened last week. Of 35,000 sq ft, this will add nearly 40% to the firm's potential capacity when fully operating. At present, it is producing 2,500 fires a week.

In the main, the Bletchley works is an assembly unit, accepting components and pressed parts from the other works. However, the coal and log effect bases are made in the factory. The method employed is the usual Magicoal method, using a wire gauze base formed to shape in a jig and covered with powdered glass. Subsequent finishing requires considerable individual skill, and the girl operatives take some six months to train. While in the more popular fires the imitation coal is formed in one piece, the log effects for overseas markets are built up by hand from individual imitation logs.

The assembly line for the fires is fitted with the usual conveyors, but the method of assembly is unusual. Instead of each assembly station being responsible for the adding of one or two components, the operative is fed with a full pack of all components and is responsible for the complete assembly of a fire. Only the back is left off so as to permit of routine testing before passing forward for packing at the end of the assembly.

The factory itself deserves particular praise. Completely modern in concept, it has an entrance hall which bears the stamp of a live firm catering for the consumer goods market. Perhaps the show place is the works canteen, or restaurant as they prefer to call it. The appearance of the room is broken up with panels to give individual tables for four and at the side something akin to a lounge is provided. Clearly, considerable thought has been given to the welfare of the staff.

Individual skill is still an essential in building imitation log fires

At the end of the assembly line, fires are routine tested before packing

Electricity in the Foundry

FACTORS AFFECTING CHOICE OF FURNACE IN METAL SMELTING

AN unusual opportunity for engineers concerned primarily with the electro-metallurgical industries to get together and discuss their problems occurred last week when the Midlands Electricity Board, in conjunction with the Institute of British Foundrymen, the National Foundry College and the British Cast Iron Research Association, organised a two-day conference in Wolverhampton. Six papers were read and discussed, of which three were on furnace design and utilisation.

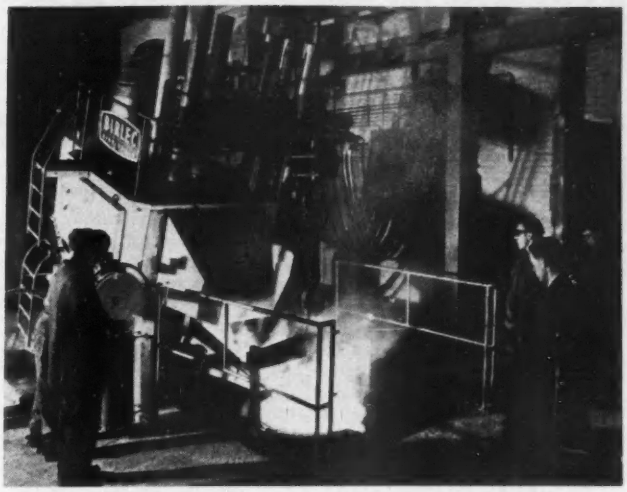


Fig. 1. Teeming a 5 ton Birlec arc furnace. Note the fume collecting hoods

Arc Furnaces

Dr Robiette, D.SC., F.I.M., introduced his paper by asserting that, from every point of view, arc furnaces are the most important type for smelting and present by far the largest connected load of any type of furnace, being responsible for about 90% of tonnage of metal smelted in this country.

Arc furnaces have less size limitation and are built in capacities up to 200 tons/single heat and in loadings up to 40 MVA. The larger furnaces are mainly used in steelworks for the production of ingots for rolling and forging, while those used in the foundry rarely exceed 30 tons capacity. Because of their freedom from products of combustion they are widely used for melting steel scrap, which has to be refined, and they are capable of producing the highest grades of steel.

The output of steel castings from electric furnaces in Britain exceeds 400,000 tons/annum and represents well over 80% of the total made by all processes. The average consumption of electricity works out at about 700 kWh/ton of molten steel. Taking a yield of castings to molten steel at 45%, this represents an annual consumption of about 630 million units/annum.

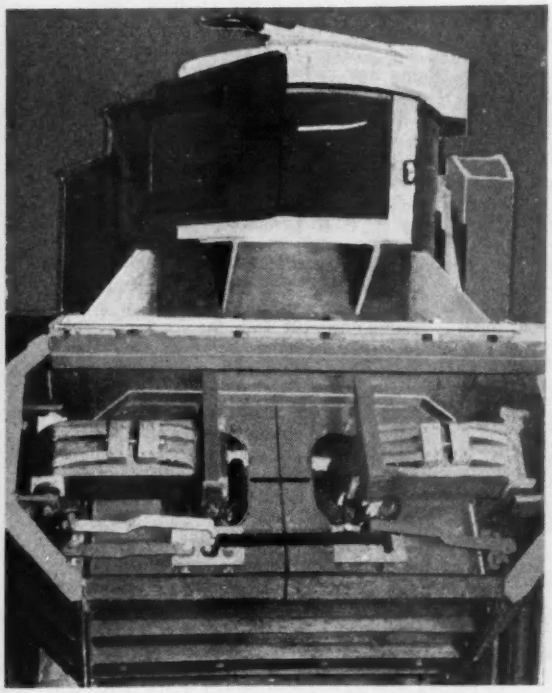


Fig. 2. A channel-type induction furnace with interchangeable sections. This design is due to Calamari and Co. of Milan and is made in the UK by Metalectric Furnaces Ltd.

Types of Furnace

Over the years since the electric arc furnace was first introduced, a host of different shapes and types have been developed, but only two have stood the test of time: the indirect rocking-arc furnace and the three-phase direct, or Heroult, furnace. The former is confined to small units, mainly installed in foundries, and comprises single-phase furnaces in which the arc is drawn between two horizontally opposed graphite electrodes. The second type, which forms the bulk of arc furnaces in use today, is a three-phase electrode assembly, mounted in triangular formation, in contact with the charge which forms the star-point. A single-phase version, originally called the series furnace, used two electrodes entering the charge vertically.

The indirect arc furnace, which has survived to the present time as the Detroit rocking furnace, transfers the heat by radiation from the flaring arc between the two electrodes to the metal pool beneath. The very nature of this form imposes excessive wear on the refractory lining and, in the Detroit furnace, this is minimised by rocking the whole unit around its central, horizontal axis, so continually washing the lining with the molten metal. Merits lie in its versatility in melting a wide range of ferrous and non-ferrous metals and the relatively low capital cost as compared with h.f. induction furnaces. The high point of demand lay somewhere between 1935 and 1950, after which there was a falling off in popularity with the introduction of mains-frequency induction furnaces.

In construction it comprises a cylindrical or spherical shaped shell with a refractory lining mounted on a horizontal axis through which the electrodes are fed. Two track rings on the outer periphery of the shell rest on two pairs of rollers on the base, one pair of which is rotated in alternating directions by a motor to impart a rocking motion to the furnace. Rocking is commenced when the metal in the centre of the furnace has begun to melt and the angle of rock is increased as the charge is reduced to the molten state.

The electrodes are carried in water-cooled bronze clamps, held by the brackets with screw feed to control the length of arc. In most modern furnaces automatic control of electrode adjust-

ment is incorporated and the electrodes are of graphite. As an electrical load it employs a voltage of 80-100, with a reactance of about 50%, and is accepted by most supply boards, when connected to an 11 kV system, up to about 250 kVA. For higher voltages and loads a three-phase arrangement is usually insisted on and this can be achieved by a three/one-phase static balancer incorporating an iron-cored reactor tapped for connection to a capacitor as shown in Fig. 5. The balanced three-phase load usually has a power factor of up to 0·87.

These furnaces are used for melting copper-rich non-ferrous alloys, special cast irons and high alloy types.

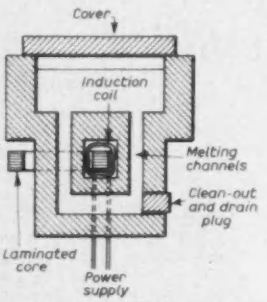


Fig. 3. A modified channel furnace, due to Manuel Tama, for aluminium smelting

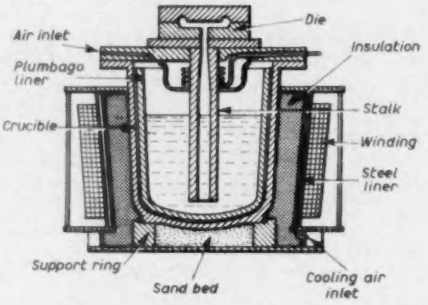


Fig. 4. A coreless furnace/die-casting unit for aluminium developed by Wild-Barfield

Direct Arc Furnaces

The direct-arc furnace was introduced about 55 years ago, and early types displayed a wide variety of shapes and sizes. Today the three-phase pattern, with the metal as the star-point electrode, is almost universal in use. Ratings are based on kVA/ton of melt and the time taken to complete a melt depends on the loading of the furnace and the amount of metal in the charge. It takes approximately 450 units to melt a ton of steel and the loading of furnaces up to about 15 tons is usually 350 kVA/ton to 450 kVA/ton and slightly lower for the larger sizes.

A three-ton furnace with a 1,500 kVA rating would, for example, melt a full charge in about one hour. Full power is only used for the melting period and has to be reduced towards the end of the melt to avoid excessive damage to the refractory lining. Initially, the electrodes touch the cold mass of metal scrap and a small pool of molten metal develops which falls to the bottom. The electrodes follow it down until the level of molten metal begins to rise. Then, as the cold scrap continues to fall into the pool, the electrodes are slowly withdrawn to keep pace with the rising tide. With the charge nearly melted, the furnace should be on half power, so a wide range of voltage tappings is essential. The British Iron and Steel Research Association is developing an automatic power controller and pilot installations are already in service.

Electrical Equipment

To limit current surges, the total reactance for the circuit must be 40% to 50% and, in the units for small furnaces, reactor and transformer are sometimes contained in the same tank with the former tapped in 5% steps. On larger furnaces, the higher percentage reactance in the leads enables smaller reactors to be used, while on a 10,000 kVA furnace the inherent impedance of the transformer enables the external reactor to be dispensed with (Fig. 6). On small furnaces, off-load tap changing is usually employed, while on the larger ones on-load tap-changing is more general. It is, however, prudent to raise the electrodes before tap-changing so as to reduce wear and tear on the contacts.

All secondary leads should be as short as possible and designed to give the minimum impedance. On the largest furnaces there has recently been a move towards using water-cooled cables.

Raising and lowering of the electrodes is a process which has been the subject of many developments and systems. Both hydraulic and electromagnetic methods have been used, the latter regulators being of the impedance type operating through contactors and reversing motors. About 12 years ago the "rotary amplifier" type of electric control, under the names of "Amplidyne" and "Rotodyne," was introduced and systems based on this are the preferred electric methods today.

Hydraulic systems, comprising hydraulic raising and lowering rams controlled by servo systems, are also widely used and are smooth and rapid in operation. There is little to choose between a good modern hydraulic or rotary amplifier installation. Electrode arms on large furnaces may weigh up to 15 tons, and it is desirable to counterbalance the load so as to enable smaller driving motors to be used.

Fume Control

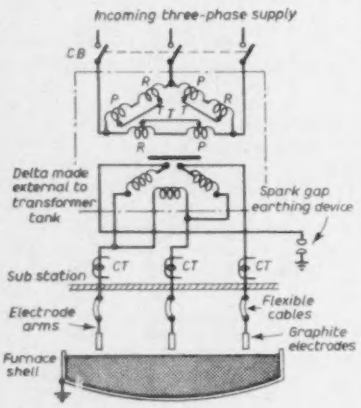
To meet the requirements of the Clean Air Act, most electric furnaces have to be equipped with fume collection and removal apparatus, particularly where oxygen blowing is employed. Two methods are possible: one takes the form of suction hoods arranged around the various furnace openings, these being connected to a common duct leading to fume extraction and washing plant; in the other, on larger furnaces, the removal is by a single hole in the roof over the electric furnace, again connected by duct to the extraction and cleaning plant.

Other innovations of recent date include methods of electro-magnetic stirring and vacuum furnaces, operating at vacua of 10^{-4}m Hg, for high grade ingot production.

Induction Furnaces

In the paper on induction furnaces, by Mr R. O. L. Clarke, B.SC., the subject was covered at considerable length. Dealing first with the basic principles, he showed how the penetration depth of induced currents in a solid bar of metal varied inversely with the frequency, the greater penetration being at the lower frequencies. He also mentioned the importance of an unbroken refractory lining; a crack which, in a radiation furnace, would be relatively unimportant could, in an induction furnace, lead to electrical breakdown. He also described the stirring effects which are inherent in induction furnaces.

Broadly speaking, there are two types of induction furnace in general use today: the channel and the coreless. In the channel-type furnace—also called the "core" type—the melt area is based on a central core of a shell-type magnetic structure with the winding on the central



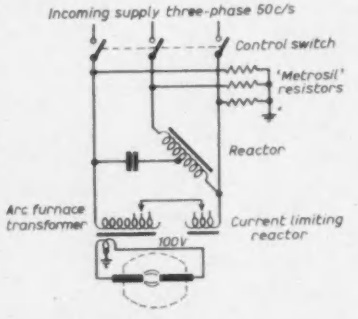


Fig. 5, above. Circuit for a single-phase arc furnace operating from a three-phase supply

Fig. 6, left. Basic circuit for a typical three-phase arc furnace with transformer and tap-changer

limb. Refractory linings on the inner surfaces of the furnace and around the central core are separated in the lower half by a channel connecting the two upper halves of the furnace. The outer limbs of the magnetic structure encircle the furnace.

In one form, due to Wyatt, the bath or reservoir above the central core is a single unit connecting both entry to and exit from the channel. Currents induced in the channel by the alternating magnetic flux in the magnetic circuit melt the included metal, and pinch effect at one side induces circulation until the whole of the upper bath is full of molten metal. In another form, the channel joins the lower ends of two separate chambers, one of which holds the molten metal emerging from the channel and the other acting as a feeding or "baling" chamber. A section through one of the former is shown diagrammatically in Fig. 3. Both types of furnace are usually mounted on trunnions for tilting, so that the molten contents can be discharged into the crucibles from the pouring outlet.

Problems with Aluminium

These furnaces are widely used for smelting non-ferrous metals, and particularly the brasses. The success of the furnace is governed by the life of the refractory and, in the higher zinc-content brasses, some preferential exudation of zinc from the melt serves to form as a coating of zinc-oxide on the refractory, so extending its life.

With aluminium smelting, the problem is different. Aluminium oxide is, itself, a refractory material and is denser than the aluminium in the molten state. The pinch effect tends to force the oxide out of solution on to the walls of the channel and, in time, will close them to the point of stopping the furnace from operating. The modified form of basic channel furnace (Fig. 3) enables the two vertical melting channels to be cleaned with straight rods, only interrupting the current for a few moments. The large cross-section of the horizontal channel avoids the necessity for frequent cleaning.

Coreless Furnaces

Coreless furnaces operating at mains frequency have been introduced into this country in recent years from the Continent, where they have undergone a great deal of development since the war. Here the coil, in the form of copper tube for water cooling, is wound round the furnace with outer packs of laminations to control the external flux. Heavy current densities are required at mains frequency and the stirring movements are considerable, so there is a limit to the rating of the furnace. The heating rate is, however, higher than in a comparable channel furnace and the vigorous stirring motion gives it its unique ability of quickly melting finely divided scrap. It is also more flexible in operation than the channel furnace.

An interesting development is shown in Fig. 4, which is due to Wild-Barfield Electric Furnaces, in collaboration with Alumsac Ltd. Designed specially for aluminium smelting, the metal is contained in a plumbago liner set in a cast iron crucible surrounded by the induction coil. This forms a pressure-tight unit from which the aluminium is forced up the central stalk into the vertical die, so producing a dense casting. The device, therefore, combines both aluminium smelting furnace and pressure die-casting in a single unit.

High frequency coreless furnaces are the most flexible of induction furnaces and can operate down to charge sizes in ounces by the choice of a suitable frequency. They normally use a fast heating rate with control of stirring by choice of frequency and are also used for vacuum melting techniques in the production of high purity metals and in semiconductor crystal zone refining.

Malleabilising Furnaces

In a paper on malleabilising furnaces, Mr T. R. Brown described the advances which had taken place in electrically heated furnaces for annealing malleable castings and general heat treatment processes. He described typical British designs and the special features of the various systems of operation.

Mr L. London Goodman gave a broad survey of the progress in automation and materials handling in the industry and Mr A. E. Savage, A.M.I.E.E., summarised the electricity tariffs and how they affected production costs in the foundry and factory. He was at pains to show the industrial consumer how he could achieve reductions on operating costs by such devices as the improvement of power factor, planning production to take advantage of off-peak rates and generally achieving a good overall load factor.

New Factory for Transmission Units

A FACTORY extension costing £4 million for the production of Borg-Warner fully automatic car transmission units has just been put into commission at Letchworth, only 18 months after site work had begun. The extension is 388 ft long by 375 ft wide and adds some 140,000 sq ft of productive space, much of which is taken up by 400 new machines.

Electricity supplies are received from the EEB at 11 kV through three 1 MVA 11 kV/415 V three-phase transformers. Each transformer supplies one section of a cubicle-type switchboard 22 ft long, controlled by 1,500 A circuit-breakers. The three sections can be coupled through bus-section switches.

View of one of the bays in the new Borg-Warner factory showing overhead trunking, with downcomers to machines and fluorescent lighting arrangements

Both lighting and power loads are sectionalised with provision for transference to another transformer in the event of a breakdown. Power is distributed throughout the factory by some 3,000 yd of 250 A four-pole overhead trunking for circuits and machines not exceeding 60 A/phase with 16 heavier distribution boards to cater for larger loads. Feeds to the trunking are by 0·2 sq in. four-core p.v.c./s.w.a./p.v.c. cables. For portable welders, 16 30 A three-phase socket-outlets are provided with special provision, in the form of a second substation with two 750 kVA transformers, for the heavier welding plant.

Supplies to individual machines are via five-core circular p.v.c. loom-braided cables, fed from the overhead trunking, and about 100 13 A socket-outlets are also available for other portable tools.

Lighting is mainly by 5 ft twin-tube 80 W fluorescent units mounted at 8 ft centres supplemented in the high crane bays by 400 W MBF/U fittings, the average intensity on the working plane being about 30 lumens/sq ft. Yard lighting is by 140 W sodium.

All cables for the new factory are of BICC manufacture, and BICC also supplied the 100 kVAr power factor capacitors with automatic control. The electrical installation was by Messrs Wm. Steward and Co., who also designed and manufactured the main switchboard.

The main switches are of 1,500 A Statter design and similar switches with Castell interlocks are installed as section couplers. Outgoing circuits are controlled by Dorman and Smith 300 A switch-fuses.

The new Borg-Warner Model 35 fully automatic transmission being made in the new factory is being introduced on several 1½ litre cars in this year's Motor Show. Many will be allocated to overseas buyers as part of the export drive.

Diagnosis of Faults in R.F. Heaters

SOME HINTS ON ROUTINE MAINTENANCE IN FACTORIES

by B. Court

THE maintenance of valve type r.f. induction heaters requires specialised knowledge and it is, therefore, essential for the engineer responsible to fully appreciate the actual working of the unit. There are firms that specialise and act as a service to industry, servicing and maintaining such generators as and when required. On the other hand, many firms engage their own maintenance staff. It is for them that this article is written.

Before proceeding, the manufacturer of such units should be approached if the breakdown or fault is beyond the scope of one's own maintenance staff, as they know the virtues of their own design.

Routine and preventive maintenance is to be recommended, as such units are operated either by unskilled or semi-skilled labour. This procedure does ensure that the equipment concerned can be depended upon so long as nothing unforeseen happens.

Care of Valves

The oscillator and rectifying valves must be kept clean and free from dirt and dust and, furthermore, the base or socket contacts should be periodically examined and kept free from corrosion or oxidation. The presence of dirt at frequencies encountered with r.f. induction heaters may lead to localised heating, resulting in valve failure.

If the oscillator valve is water-cooled, then the anode may become coated with scale or lime deposit during service. Such deposits must be carefully removed either by an acid wash or by careful scraping. Failure to take this precaution will interfere with the transfer of heat from the anode. It may be as well to mention at this stage that the cooling water should be clean and as pure as possible, otherwise lime deposits or other contaminants may restrict the water flow to the valve resulting in its final destruction.

Condensation or water leaking from any of the water feeds must be avoided, otherwise droplets falling upon the hot glass envelopes of any of the valves will result in their cracking and going down to air. The minimum permissible water flow is always specified by the valve manufacturer. This is an important factor and should never be ignored. Failure to observe this rating will cause the anode temperature of the oscillator valve to be exceeded, thus resulting in the early destruction of the valve.

Similarly, if forced-air-cooled valves are used, then the forced air stream must not in any way be impeded. Likewise, the radiator attached to the valve must not become clogged with dirt, fluff or lint. Many manufacturers of equipment do, however, incorporate filters in the air intake so as to reduce to a minimum the quantity of dirt, etc., that is likely to be drawn in through the air cooling system. Periodic cleaning of these filters is an essential in preventive maintenance otherwise over-dissipation can result.

When replacing a faulty valve, the engineer will have to install it with care otherwise mechancial damage to the glass will result.

Should the glass become damaged, the valve will, when switched on, fill with whitish fumes, an indication that the valve has developed a leak and is useless.

Erratic operation of the induction heater can also be the result of the oscillator valve failing. Substitution will either cure this fault or indicate that the trouble is elsewhere. In the latter case, it may be the result of insufficient grid drive and indicates that the grid resistor or grid to tank coil spacing are to be suspected. A faulty tank condenser is another possibility.

Slow heating of the work part is an indication that there is poor coupling in the output circuit, the work coil has an insufficient number of turns, or that the diameter of the coil is too large for the work piece being processed. Advice on this fault can be readily obtained from the manufacturers.

In conclusion, it is as well to mention that induction heaters should only be operated with all doors closed, otherwise equipments located nearby in the factory may be affected by r.f. radiation. This, however, is usually taken care of as most units are interlocked for safety reasons, but where a panel can be removed for maintenance purposes and is not interlocked, then it should be replaced *in situ* before operating the equipment continuously. Furthermore, it is essential that maintenance should only be carried out by experienced personnel bearing in mind that high voltages are present.

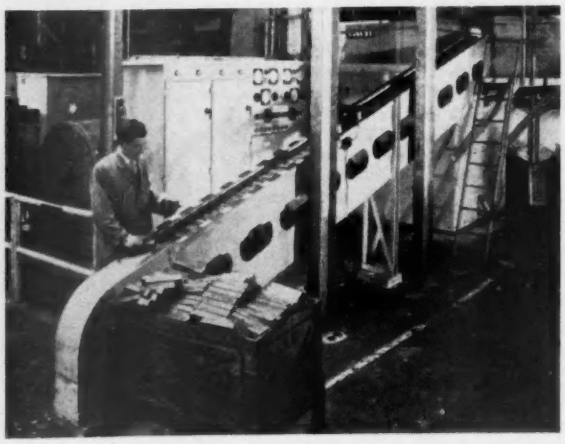
New Electric Billet-heating Furnace

A NEW electric billet-heating furnace has recently been installed at the Longbridge works of the Austin Motor Co., a member of the British Motor Corporation, where it replaces three oil-fired furnaces. The new unit, specially designed by GWB Furnaces Ltd., is a two-tunnel induction heater for heating manganese-molybdenum billets prior to forging.

Each billet, 1⅛ in. square by 8⅛ in. long or 1½ in. square by 7⅛ in. long, is heated to 1,250°C in 13 sec to 14 sec, giving a total output rate for the furnace of one billet each 6½ sec to 7 sec. The hot billets emerge on to an inclined plane which delivers them to the bed of a reducing roll for three reducing operations before entering, by hand feed, the forging press. Each billet makes one pair of connecting rods for a car engine.

The water-cooled heating coils are 58 in. long and are supplied from a pair of 30 kW 2,500 c/s motor alternator sets comprising a 485 h.p. induction motor coupled to the alternator on a common baseplate. Power factor correction is effected by switched capacitors housed in the base of the furnace.

It is said that the new installation will have twice the output of the three oil-fired furnaces which it replaces.



A general view of the new GWB induction type billet-heating furnace at Austin Motor Works, Longbridge

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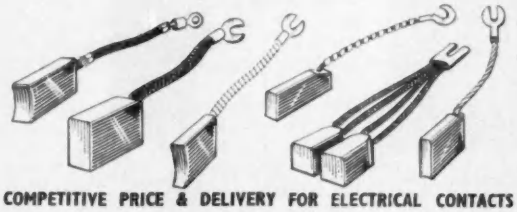

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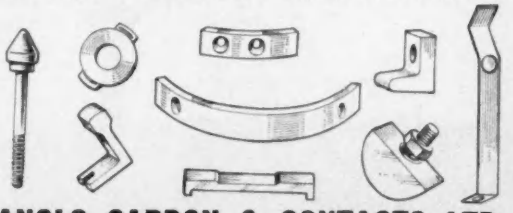

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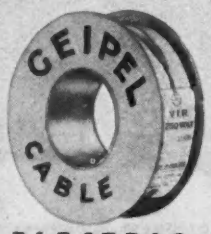

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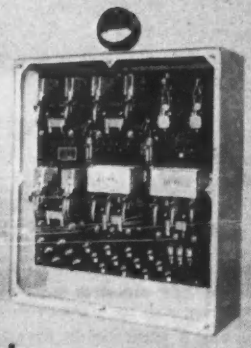

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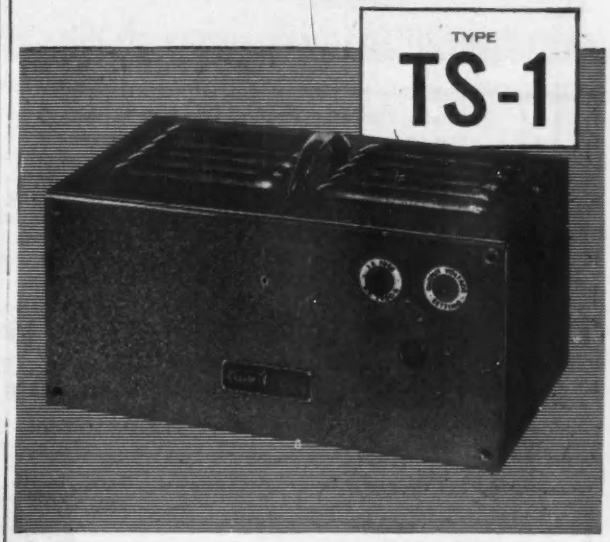

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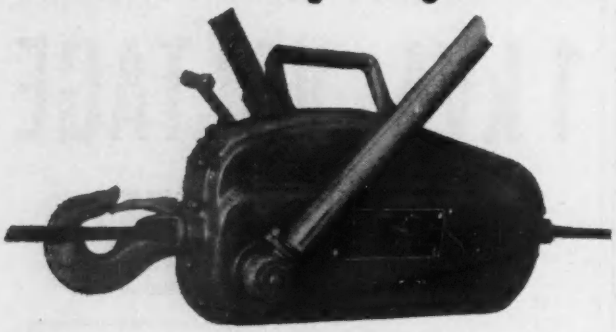

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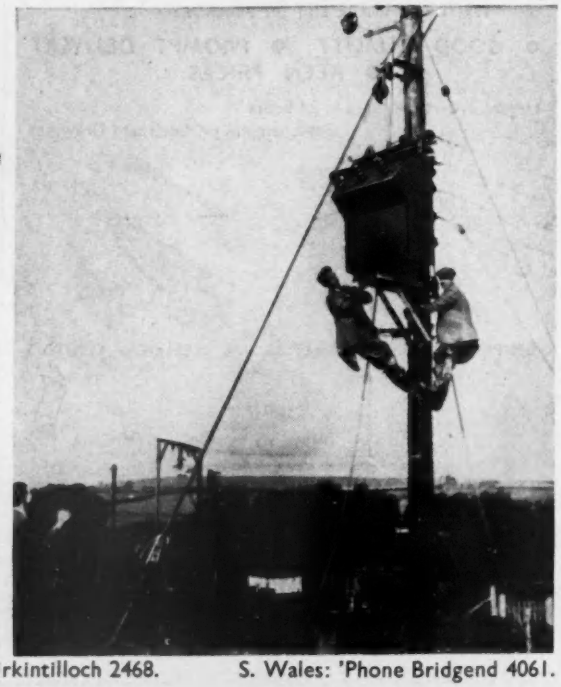

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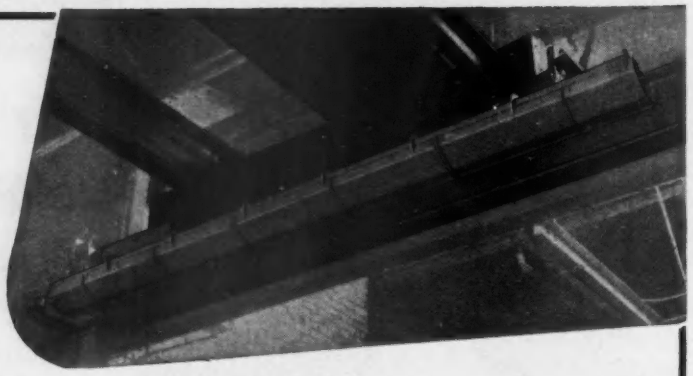

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Enclosures Without Doors

FACTORS IN THE INDUSTRIAL USE OF AIR-SCREENS

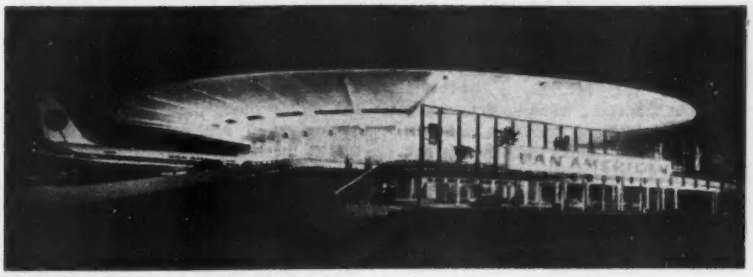
WITHIN comparatively recent times there has arisen a technique of enclosing the warmed air content of shops and offices by a barrier of warmed air flowing downwards from vents over the entrances, so permitting the doors to be left permanently open or dispensed with altogether. It must have occurred to many that the same technique would have many advantages in the large plant or factory where constant traffic of personnel and small trucks or trolleys between the different bays is a headache both to the ventilation engineer and the maintenance staff who have to keep the equipment and doors in repair. Without the doors, which in some cases are little more than swinging rubber flaps, traffic could go unimpeded with less risk of injury to personnel or damage to the structure, vehicle or the goods that it is carrying. Moreover, delivery would be accelerated.

Are such air-screens possible for industry? The answer is that they are, but the initial cost may be rather higher, in the case of a full top-and-bottom system, than considered justifiable in certain circumstances. Much will depend upon the individual case and the incidence of local air currents.

Factors in Design

The air-screen in its simplest form comprises a fan-accelerated flow of warmed air forced downwards from a discharge plenum located immediately above the entrance. Such a discharge is located at one point only, and the emerging airstream, which acts as a thermal barrier, will sway one way or the other under the influence of air currents on either side of the opening.

In the developed form, a second locating point is a grille in the floor immediately below the discharge plenum outlet and this is coupled to a suction system which draws in the current and so tends to anchor it at top and bottom. The additional merit of the system is that it enables a large proportion of the already heated air to be retrieved, filtered, re-warmed and recirculated with considerable saving in the heating costs.



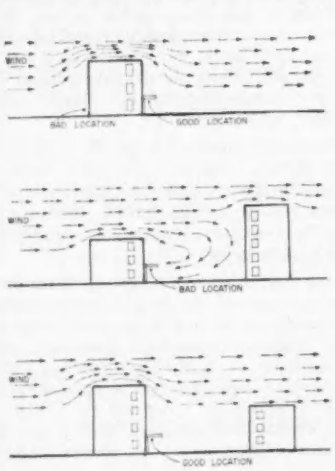
The Pan American Airway Terminal at New York showing the decorative screen behind which is the 89 ft wide air-entrance, largest in the world

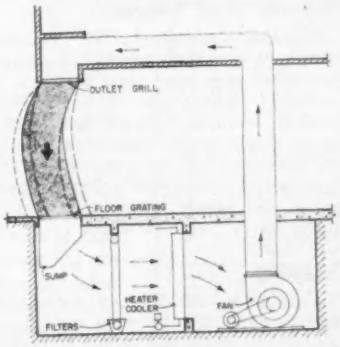
The first problem is that of "stack effect." This is related to the height of the structure and is measurable in the case of existing buildings. For new buildings it can be predicted on the basis of empirical data.

The next problem is that of orientation. In the extreme case, an entrance facing into the prevailing wind is almost impossible to seal by an airstream unless a wind-screen is used. In most cases some degree of screening can be given by other buildings in the vicinity, though it may happen that their presence aggravates, rather than alleviates, the condition. This is illustrated in the diagram, below.

The third factor is height of opening. If this is excessively high for normal traffic, a downwards extended plenum can be built to shorten the path of the air-flow between entrance and exit. In the commercial installation, both wind-screens and extended plenums have to conform with the architecture, and this may add to expense; in the industrial application, simpler and cheaper forms can be used. Doors, for security during non-working hours, can be folded or slid back from the entrance.

The final problem is that of locating the associated equipment, choice of heating system and location of ducts, etc.





Above. The operating components of a recirculating air-screen installation showing how the air-barrier is anchored at top and bottom

Left. The effect of wind currents in conjunction with buildings on the siting of air-entrances

Width of Opening

Given suitable conditions, the width of opening is almost unlimited. The classic example from recent installations is that of the Pan American Airway Terminal at New York where, by the intelligent use of screens and a 23 ft high glass-enclosed plenum, an 89 ft wide by 7 ft high air-entrance functions satisfactorily in one of the most exposed positions imaginable.

In Britain, a top-and-bottom recirculating air-door is installed at British Nylon Spinners, Pontypool, to maintain a pressure differential between adjacent bays where processes necessitate different ambient conditions. Incidentally, a single exit system, sometimes referred to as "door-heating," will only be satisfactory against pressure differentials corresponding to about 1 m.p.h.; top-and-bottom systems will withstand about ten times as much.

Another installation of interest is in the cold stores of the Express Dairy Co. at Brentford, where an air-screen maintains a barrier between the inner cold and outer normal ambient areas consistently with considerable traffic.

An installation of "door-heating," now under erection at the South Wales Steel Co., comprises nine doors each 16 ft wide and served by four 4 ft modules, the doors being coupled automatically with button-operated roller shutters so that they come into service immediately the doors begin to rise.

Each of these installations has been planned by Sulzer Bros. Ltd., who are among the leaders in this field of technology and who welcome inquiries from industry generally, where either door-heating or air-doors may be applicable.

Supply for Viscose Manufacture

PLANT DEVELOPMENTS BY COURTAULDS

DEVELOPMENTS in electricity distribution and electrical equipment in viscose manufacture provided a theme for Mr C. F. Freeman, B.SC.(ENG.), M.I.E.E., when he delivered his inaugural address as chairman of the IEE South Midland Centre recently. Mr Freeman is chief electrical engineer to Courtaulds Ltd.

In the rayon industry, substation capacities rarely exceed 1,500 kVA, but the cost and current rating of h.v. switchgear for lower transformer ratings together with the high degree of reliability achieved in transformers, have encouraged the use of single 1,500 kVA transformers in such substations. In some substations the experiment has been tried of mounting the transformers at ground level and the m.v. switchgear at first-floor level. There are advantages in the ease with which cables can be got away at roof level in a single-storey factory. However, difficulty has been caused by small settlements of the plinth on which a transformer stands. This has demonstrated the need for extreme flexibility in the vertical copper strip connections between transformer and switchgear and made them much less simple than originally visualised.

Use of single large transformers has brought an example of the need to relearn technical knowledge from time to time. Overheating in the single-core m.v. cable glands associated with one such installation was soon traced to the supply by manufacturers of cast-iron glands instead of the traditional brass glands. But it was overlooked that with two s.c. cables to each phase all arranged in a straight line—two red phase, then two yellow, then two blue—the current division between cables in the two pairs in the outer phases was uneven. The answer was quickly found by the older engineers, used to trefoiling.

The rayon industry makes great use of small vertical motors carrying a box for collecting rayon yarn immediately after it has been spun. These motors operate at relatively high speed, currently on a 120 c/s supply. Many design difficulties have been overcome during the years, in connection with lubrication and bearing arrangements. Overload protection is one problem to which no really satisfactory answer has been found. Use has been made of low melting point alloys for the star point of the winding and of small cartridge fuses, but neither has been wholly satisfactory and both have been discarded almost completely.

Current practice is to use a good winding that will stand a fair amount of hard treatment and then let the motor run until it gives up and requires rewinding. High temperature insulation has been tried as a means of increasing output from the motors, but such insulation has two disadvantages. The windings are made much more costly and parts of the motor other than the windings, for example ball bearings, are not able to match the higher temperatures of operation.

The latest design of spinning box for this application uses, like its predecessors, the basic principle of a flexible shaft motor carried on a flexible support, but incorporates many improvements. However, compared with the older motors, it runs at something like half load, but watt for watt of output is less efficient and has a worse power factor. In the result, supply equipment, such as cables, has to carry appreciably heavier currents for the same duty.

Dielectric Heater

As an example of special equipment designed to meet the needs of only a few users, Mr Freeman describes a 180 kW 25 Mc/s dielectric heater which dries viscose rayon cakes; cylinders of yarn about 7 in. in outside dia, 4¼ in. inside dia and 6 in. deep. Each cake when wet contains about 3 lb of water, and this is evaporated by the dielectric drier in about ten minutes instead of the ten days or so required by older methods using air drying. A single oscillator valve is used, costing around £1,100 and with average life of between 3,000 hr and 5,000 hr. Cost of this added to the relatively low electrical efficiency of the system makes it more expensive than air drying using steam heating, but it gives a somewhat better quality in certain types of textile yarn. Radio interference problems with this machine have been tackled by controlling frequency within a band such that none of the harmonics affect either TV or VHF radio reception.

Portable Tool Voltage

Touching on safety, Mr Freeman comments that many years of experience by many users show that both 110 V mid-point earthed and 50 V mid-point earthed are safe voltages for portable tools. Not a single fatality has been recorded in the UK for either voltage. He considers it "incredible" that so many users still persist with portable tools operating at 240 V to earth.

Lighting

Courtaulds Ltd. decided some years ago to appoint a full-time lighting engineer. His job is not merely to provide the right number of lumens at the right place and with a proper absence of glare, but to do that with proper regard for both capital and running costs and to matters like appearance.

In a large organisation, lighting installations will have a different balance between functional and decorative values in different applications. Therefore, the lighting engineer needs to be able to work in harmony with architects and, above all, to understand and interpret the needs of the actual user. "He must be proxy for the user." Preparation of standard specifications for lighting requires a very careful analysis of user needs.

Future Developments

Looking to the future, Mr Freeman asks for greater simplicity in industrial tariffs, which he calls "an accountant's dream and a works manager's nightmare." The complexity of tariffs at present makes cost of electricity an intangible in the planning stage of an industrial project so it becomes a brake of adventure. He also stresses the importance of complete continuity of supplies in some industrial processes, and expresses his belief in the simple radial feeder for security rather than a network. Alternative supplies are sometimes no substitute for a single supply engineered to a high standard.

From the users' aspect, a better quality supply with fewer serious momentary voltage dips would be welcome. A large number of motors slowing down for one or two seconds and then accelerating again may bring a current surge difficulty to deal with, and special time-delay units may have to be developed.

Higher Frequencies

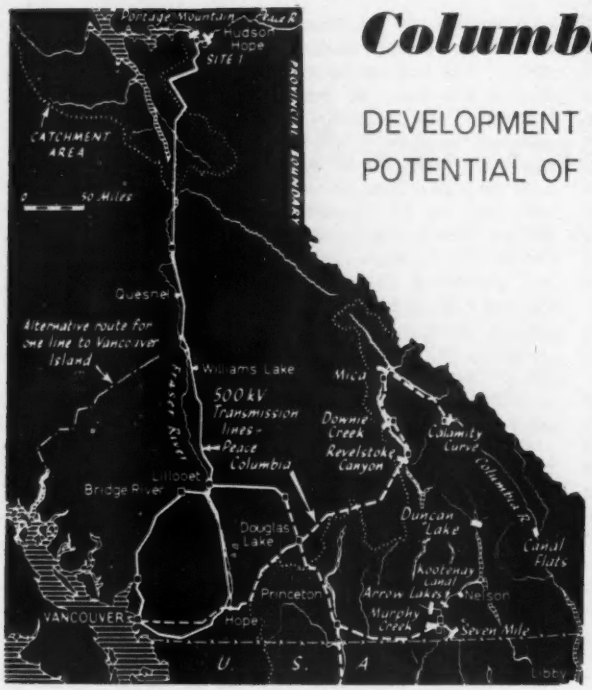
Mr Freeman believes that industrial users of electricity may well sponsor greater use of high and variable frequencies. In the man-made fibre industry, frequencies up to 200 c/s have been used for many years for motor drives. In some textile fibre applications, use is made of motors with their speed frequency controlled, the variable frequency supply being provided by silicon controlled rectifier units.

Variable speeds are in growing demand for process control, and there seems reason to believe that the answer can be found in providing variable frequency supplies, perhaps with greater reliability than other means.

Even with lighting, there seems certain to be increased use of high frequencies, especially as the use of fluorescent lamps and electro-luminescence increases. At frequencies of a few kc/s the auxiliary equipment becomes very simple and, if the frequency is taken up to 15 kc/s, the luminous efficiency of fluorescence is nearly doubled.

Columbia or Peace?

DEVELOPMENT OF THE HYDRO-ELECTRIC POTENTIAL OF THESE CANADIAN RIVERS STILL UNDECIDED



Two immense schemes to exploit British Columbia's hydro-potential rival for development. In the north, the Peace River scheme with two dams and in the south the Columbia River project which would have 10 dams in Canada, one in the USA, and which would also provide much needed flood control in the USA

CONTROVERSY continues to rage in Canada over the British Columbia Peace River and Columbia River hydro-electric development schemes, with arguments, unfortunately, not always concerned with either scheme's engineering or economic merits. The Columbia project would add over 4,600 MW of plant—67% more than the total 2,759 MW of hydro-electric plant installed in the Province at the beginning of this year—while the Peace project would provide over 3,100 MW of plant.

A report (A) prepared by the consultants, Sir Alexander Gibb and Partners and Messrs Merz and McLellan, has analysed plans prepared for the two projects and found them technically sound. The report examined capital and energy costs of the two schemes, but within the terms of reference laid down by the British Columbia Energy Board, at whose request it was prepared. This report has recently been made available to the public in BC and it also formed the basis for a report (B) presented by the BC Energy Board to the BC Government at the beginning of August. The Energy Board report (B) interprets report (A), but does not record all of its findings.

One Scheme Only

Whichever project is started first, report (A) says, overlapping the construction work on both schemes could only be justified economically if the guaranteed market for export power was so large that it would be impracticable to meet the combined requirements of the Province and the export market by accelerating construction of the first project. Simultaneous construction therefore seems unlikely, particularly as the annual load growth is only 120 MW, but the Provincial Government, favouring the Peace project, recently appointed a project manager, while the Federal Government in Ottawa has signified that it will do all in its power to forward development of the Columbia River scheme, so that a showdown seems imminent. With the recent takeover of the Peace River Development Co. by the BC Government, either scheme would presumably be publicly financed and open to international tender.

The Federal Government is closely concerned with the BC developments through the agreement signed with the US Government in January, 1961, for the joint development of the Columbia River. This treaty, which has yet to be ratified, would provide badly needed flood control for the USA, in return for which BC would get $64·4 million lump sum compensation for land flooding and also a 50% share of the downstream benefits amounting to a firm capacity of 1,312 MW by 1970 and an estimated 6,700 million kWh/annum.

This lump sum would give an estimated 10% reduction in the Columbia capital cost, but it has been omitted from the reports as the BC Government proposes to set up a Trust Fund to compensate the Province for revenue loss from the flooded areas. However, flowage costs in the consultant's report, of more than $90 million for the Columbia project, appear to cover compensation adequately.

The table shows comparative costs of energy at load centres obtained from the two reports. The cost of dis-

Peace and Columbia Salient Details

From Report	Project		Columbia		Peace	
	Load Growth Estimate		High†	Low	High	Low
A, B	Av. energy cost Mills/kWh at B.C. load centres to 1985	Private:	—	—	6·42	6·59
B		Public:	4·03	4·4	4·2	4·37
A		Public:	3·61	4·4	4·2	4·37
B	1985 firm capacity MW (at load centres)		4,070	4,140	3,119	3,084
B	Capital investment $ million public financing over: yrs.		1,202 17	1,284 22	877 14	883 19
A	Capital investment $ million public/private* over: yrs.		1,325 18	1,284 22	961* 14*	1,008* 19*
A	Columbia developed to same extent as Peace $ million		730	890	—	—
A	Firm energy at load centres <Wh × 10⁹		25,700	20,600	15,350	
A	Total installed capacity MW in 1985 (including downstream benefits)		4,951	4,404	3,410	

A—Consultants. B—B.C. Energy Board
† For Columbia with high load growth estimate, Reports A and B relate to different schemes of development

tributing the energy from the load centres to the consumers would amount, on average, to an additional 7 mills/kWh supplied from each of the schemes, so that the difference in cost of energy from the two schemes becomes less significant. The average cost of energy to the consumer was quoted in the BC Power Corporation report for 1960 as 22 mills/kWh. However, this figure is not strictly comparable with the above costs because such factors as payment for existing plant, overheads and costs of thermal generation have to be taken into account. Such costs must, of course, be necessarily only a guide, for not only has much more preliminary work to be done on the schemes, but interest rates and other financial factors are liable to substantial variation. This would have been particularly true for the Peace as the private development originally considered in report (A).

The short time available for preparation of report (A) made it possible only to examine the two existing plans. However, this report observes that the Columbia plan does not necessarily give optimum development of the hydro potential, and for both schemes costs were based on a 500 kV transmission system instead of the 345 kV envisaged in the plans.

Both reports consider capital expenditure on a year-by-year basis for high and low load growth. In report (A) the high load growth includes, for the Columbia plan, estimates approved by the BC Energy Board of future needs of the Cominco group and three substantial block loads for potential new industries. Similar loads, but not in the same localities, are assumed for the Peace project. In report (A) the cost of energy takes into account benefits from these estimated load growths and also improved operation of private utilities operating on the Kootenay River which would obtain from the river control provided by the Columbia dams. Report (B) omits these considerations in computing cost of energy, on the grounds that Cominco requirements are uncertain and that the way in which benefits should be taken into account for the private stations has not yet been decided. However, that these factors will have an important overall effect, even if hidden, on the Columbia scheme energy cost is certain, especially as these private utilities are also scheduled for appropriation by the BC Government. Costs for Columbia with the higher load growth as quoted in report (B) were calculated by the Consultants at the request of the BC Energy Board, subsequent to report (A). These costs exclude the Cominco and West Kootenay Power Co. load and generating stations. In report (A), these loads and stations were included for the higher growth but excluded for the lower load growth.

Report (A) also points out that previous estimates for the projects were prepared by different bodies without co-ordination, and that, therefore, there is no common basis for assessing relative merits of the schemes.

Report (B) states that costs of Columbia and Peace power would be practically indistinguishable under the same conditions of financing, load growth and load factors. But this is subject to the reservations about inclusion of downstream benefits and other factors referred to above affecting energy cost computation.

From a 6 ft high pile of official documents and a mountain of unofficial comment it is only possible to mention some of the major factors in a controversy so vital to Canada's power development. Two other factors should, however, also be borne in mind. If surplus Canadian power was exported to the States—in itself a thorny question—estimates indicate that the Columbia cost would be reduced by a further 0·22 mills. The second point is that under the treaty terms Canada has only a limited time to construct the flood control dams. Delay on this work, necessitating hurried construction with possible on-site alterations, could affect the cost estimates appreciably.

Engineering in East and Central Africa

EAST AFRICA and Central Africa have large electrical engineering developments afoot which will bring a need for more and more engineers. What the chances are of providing these men from the local population provided the principal theme in the presidential address of Professor Sir Willis Jackson, F.R.S., to the ASEE.

At present, IEE membership in Uganda, Kenya, Tanganyika and Zanzibar totals 215, including 120 corporate members. Four corporate members are of Asian origin, none African. In the Rhodesias, none of the 221 corporate members is of non-European stock. The ASEE has a "substantial and growing" membership in Africa.

Local educational opportunities at professional engineering level in Kenya are provided at the Royal College, Nairobi. However, there are currently only 20 electrical engineers in training there. Moreover, out of 17 people in the fifth year of the engineering faculty (covering all specialities, only two are African and they are the survivors of 24 who entered the first year together. This last statistic is attributed to lack of prior contact with engineering devices and to the inability of the African, so it seems, to visualise in three dimensions. This African difficulty with engineering is emphasised by the failure to gain a degree of any of the 15 Kenya African students who have come to UK universities during the past ten years to study engineering.

Sir Willis comments that the inability of African students to succeed in engineering raises two disturbing issues. Asian students do not experience similar difficulty and, as there seems a danger that, on independence of the East African countries, locally born professional engineers may be dominantly Asian and not African. Another problem concerns what may happen to the standard of engineering degree awards at African universities.

Results of such difficulties will show only after a number of years. Sir Willis admits to immediate anxiety about vacancies left by withdrawing British professional engineers becoming filled by men of other nationalities "to the ultimate serious detriment of our business prospects in the electrical field." He suggests it might be wise national policy for the British electricity authorities to organise a scheme for the secondment of staff to Africa.

The situation in the Rhodesias is worse as regards Africans being educated than in East Africa. There are not even teaching provisions at craft level, although this is being righted. Training for technicians is developing in East Africa, and training for craftsmen is, in Sir Willis's view, well organised.

Concluding his address, Sir Willis underlines again the necessity to devise means quickly by which engineers from the UK can be sent to the developing countries on secondment to occupy positions in the public services and in education. Staff is being lost at present because of the uncertainty of political developments. Secondly, Britain has to devise means of offering good practical training to an increasing number of young people from overseas, both within manufacturing industries and within the public services.

Cash returns for research

E.R.A. WORK BENEFITS ELECTRICITY CONSUMER

RESEARCH projects of the Electrical Research Association frequently result in substantial financial savings for users of electricity. Instances where this has occurred stand out in the account of "Research in the Field of Electricity Utilisation," which Dr H. G. Taylor, D.SC.(ENG.), M.I.E.E., director, ERA, delivered as his inaugural address to the Utilisation Section of the IEE.

Dr Taylor began by dealing with agriculture and horticulture. One of the early ERA interests was the hammer mill. Despite early discouragement from the agricultural engineering industry, the ERA persisted with investigations into these machines. By 1945 there were 1,500 farm installations, and today Dr Taylor estimates that there are some tens of thousands. Farmers can save between £3 and £5/ton by milling home-grown produce, as against buying proprietary feeding stuffs, using the 3 h.p. automatic mill developed as a result of ERA work.

ERA work in the field of crop drying has been particularly successful. Barn hay drying entailed lengthy experiments in several locations to demonstrate its practicability but, by 1950, it was possible for the ERA to design and finance an installation run by a farmer under normal operating conditions. That installation produced (at 1950 prices) hay dried at a cost of £3/ton. From that time, installations have extended until one area board alone now reports 1,260 all-electric crop dryers on its system having a loading of 37·8 MW and a consumption of about 30 million kWh/year.

In horticultural applications, the ERA introduced dosage methods of heating in early salad frames and the use of directly buried iron-heating wire. This work has not resulted in much commercial application because of the uncertain returns for early lettuces. More success has been achieved with the use of artificial lighting to promote plant growth. The most satisfactory source available at present is the 400 W mercury-vapour lamp. It has been demonstrated that use of supplementary light in the period November to February should offer an annual cash return with tomato plants of the order of £500/acre. The horticultural industry, however, although accepting the technique for cucumbers, has not taken it up for tomatoes as widely as had been hoped.

Floor-warming

ERA activity in the space-heating field is widely recognised. The use of a concrete floor containing buried electric conductors to provide full or background heating was investigated by the association in the years 1943-46.

Recent ERA laboratory experiments using a special test room have shown that the temperature drop across a good quality carpet combined with a good quality underlay may be of the order of 5°F/W/sq ft upward heat flow. There is little difference between the effect of a woven felt underlay and rubber underlay. On a suspended floor, presence of carpet and underlay reduces the proportion of heat flowing upwards into the room by between 18% and 25%. Finally, to get comfort under extreme conditions in Great Britain may require the existence of temperatures as high as 132°F at the interface between the floor proper and the underside of the underlay, and thus cable temperatures of up to 190°F.

Water Heating

An example of a detailed investigation bringing big returns is associated with the problem of scaling and immersion heaters. The deposition of carbonate scale by water is temperature sensitive, the rate increasing rapidly above 140°F. Thus a proposal to limit the length of immersion heaters threatened to aggravate the scaling problem. ERA work showed that from 50 W/sq in. to between 15 W/sq in. and 10 W/sq in. there was a small linear fall of temperature over the range of storage water temperatures of 140°F to 180°F. Below this loading, the sheath temperature fell rapidly. It was estimated that in the 13 years from 1958, losses due to failure of immersion heaters would amount to nearly £1 million, about 40% in soft water areas.

Another water-heating investigation is concerned with the case where an electric immersion heater is used in a tank normally supplied in the winter by a coke- or coal-fired boiler at a lower level. With certain designs of pipe work there is a risk of hot water circulating downwards in summer months. It was shown by ERA that this loss could amount to 30 kW/hr/week, representing half as much energy consumption again for hot water.

FLP Enclosures

Turning to more technical matters, Dr Taylor considers welding, flameproof equipment and radio interference. In recent years, interest in flameproof equipment has extended well beyond the coal-mining field. The exact behaviour of an exploding gas mixture is only partially understood, but it has been demonstrated that the pressure developed depends on the ratio of gas to air. But it varies with the type of gas and when the pressure is not the same for a given gas-air mixture in vessels of identical shape but of different size. The greatest pressure is obtained by using a spherical vessel with an explosion at the centre, but the maximum rate of rise of pressure varies with the type of gas.

ERA work has investigated many details of the behaviour of FLP enclosures. Amongst the points demonstrated has been one with a flange which is broad enough to take the bolt holes and to provide a saving which cannot be improved from the FLP aspect by being made broader. Ignition near the flange is much more likely to cause external explosion than ignition remote from the flange. Flange gap opening has recently been found to be an important effect, and stiffening the flange has made it possible to increase the maximum permissible gap for some causes which have rapid explosion pressure rise.

new products and appliances

New idea in cable binding

A NEW idea in cable binding, the "Helazip," has been announced by Hellermann. It is a flexible p.v.c. tape with interlocking beading along each edge. This is wrapped around the length of cable and interlocked simply by zipping the two sides together. The plastics cable covering is dust and moisture proof and specially designed for varied atmospheric conditions. The "Helazip" allows wires to be traced without difficulty and can also be used in place of conduit. In certain circumstances it is said to have application as a cover for conduit giving protection from corrosion. Wall thickness is 0·015 in. to 0·020 in. and inside diameters in a range from ¼ in. to 3 in. *Hellermann Ltd., Gatwick Rd, Crawley.*

Price changes

DUE to rising costs of material and labour, Aerialite have increased the price of their "Trapeze" lightweight earthrod, part No. 163, from 3s 3d to 4s 6d.

Price stability has been one of the main objectives of MK Electric during the year and their 1962 catalogue shows increases of only a few isolated items, even in the face of rising material and labour costs.

Aerialite Ltd., Stalybridge, Ches.
MK Electric Ltd., Shrubbery Rd, N.9.

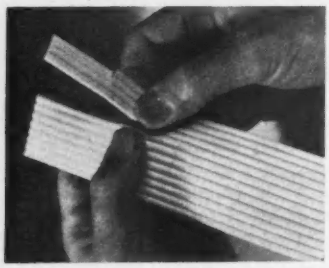
Sonic flame detection

A COMPLETELY new method of detecting flames has been developed following a recent laboratory discovery that flame envelopes of all types reflect sound waves. It is thought that this is due to the difference in density of the flame as compared with the surrounding gases, no matter how hot. The new device, "Sonotek," which is in an advanced stage of development, uses reflection and transmission techniques in combination with normal flicker circuits of the "Elcontrol" type. Broadly, the principle is that of transmitting a supersonic beam in the direction from which flames may be expected and to measure the reflected sound for modulation. Initially, the reflections from solid surfaces in the vicinity are monitored and allowed for, but the main principle remains that the reflections from flame areas are of a flickering type, even though the flame appears steady. It is the flickering type of modulation which is detected and used to operate the relay in the indicator or alarm circuit. *Elcontrol Ltd., Wilbury Way, Hitchin, Herts.*

Hellermann's p.v.c. cable binding sheath

Fillings for screwholes

YET another ingenious and simple form of filling for holes drilled in brickwork or masonry to take wood screws is "Stripfix," a plastic strip divided into 12 ribs serrated at ⅜ in. intervals and, what is more, any size of hole in diameter or length can be filled to take any size of screw with the one standard piece of "Stripfix." Just tear off a suitable length and width along the dividing lines and roll into a plug for insertion; then fix your screw. Over 100 permanent fixings can be made from a single 2s strip. *Tornado Fixings, 27-37 Broadwick St, London W.1.*



"Stripfix," a novel material for use in fixing screws in masonry, etc.

Range of fittings extended

THE introduction this month of a range of tungsten fittings marks an extension to their lighting products by Stearn Electric. Moderately priced, this range offers a comprehensive coverage of commercial fittings in three-ply opal glass spheres. For ceiling mounting there are screw-neck spheroids, with bakelite or chromium-plated base plates and lipped spheres with similar bases. Four models are designed as pendant fittings with monkscap spheres. Both chain-link and tubular suspension are available. A wall-mounting unit has also been provided in the form of a screw-neck angle sphere. Prices, which do not include purchase tax, vary from 11s for 40 W to 60 W lipped spheres to £1 14s 1d for 35 in. tube suspension monkscap sphere. *Stearn Electric Co. Ltd., Vauxhall Bridge Rd, S.W.1.*

Neon signal fuse holder

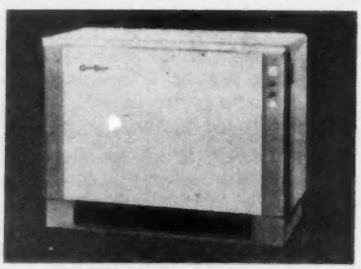
PROVIDING instant location of a blown fuse is a neon signal fuseholder recently introduced by Bulgin. Principally for application in television transmitters and telecommunication apparatus it takes a standard 1¼ in. by ¼ in. dia BS 2950/A fuse up to 5 A rating between 110 V to 125 V and 200 V to 250 V. Fuses, when blown, can be replaced from the front, which projects from the panel face. Connections are solder tags, and lenses are at present clear, although other colours may be available in the future. *A. F. Bulgin and Co. Ltd., By-pass Rd, Barking.*

Thermal storage heater price cut

THERMODARE have slightly reduced the cost of their recently introduced thermal block storage heater, D.25. The original price quoted was £22 18s, which has now been cut to £22 15s 11d including purchase tax, surcharge and a service and siting charge of £1. *Thermodare (GB) Ltd., Petty France, S.W.1.*

Fan accelerated storage heaters

A DEVELOPMENT of the thermal storage heating device for charging during off-peak periods and use at any convenient moment, the "Constor" comprises a central core of special composition enclosing embedded heating elements with inverted "U" channels through which the air is forced by a tangential bladed fan accommodated in the base. The whole is lagged and enclosed within an attractive casing, the outlet being at ground level. Rapid heating is effected by switching on the fan with the device fully charged and a thermostatically controlled air by-pass regulates the temperature of the air emitted. Four loadings and sizes are available. The largest, with a rating of 6 kW and a storage capacity of 164,000 B.Th.U, is 41 in. long by 29½ in. high by 16½ in. deep and weighs 616 lb. The smallest has a rating of 2 kW and a storage capacity of 55,000 B.Th.U. It is 28¾ in. long by 27 in. high and 13 in. deep. *Bastian and Allen Ltd., Ferndale Terrace, Harrow, Middlesex.*



The "Constor" Model 60 has a loading of 6 kW and a thermal storage capacity of 164,000 B.Th.U.

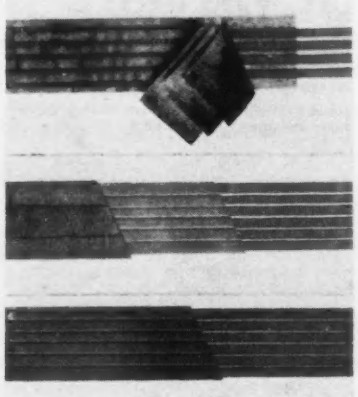
New semiconductor products

NEW semiconductor products recently announced include a variable capacity silicon diode designed to take the place of conventional trimmers, and even gang capacitors, which is extremely competitive in price. They are diffused silicon diodes, the capacitance of which depends on the reverse bias potential applied to them.

Another range of p.n.p. junction transistors, the OC700 series, is claimed as being the cheapest yet available in the UK. There are five in all and they are designed to meet the needs of most low frequency applications. All are based on silicon and can be used in many applications for which germanium transistors were previously considered necessary. Each transistor is hermetically sealed in a metal can 5·8 mm dia by 8·5 mm long and the maximum weight is 0·7 gm. Technical details are given in a series of bulletins. Yet another new range is of zener diodes, considerably reduced in price. *Brush Crystal Co. Ltd., Hythe, Southampton.*

Heating tapes

TO the engineer faced with the problem of heating pipe-lines or the laboratory assistant making up an experimental gas heating circuit—to mention but two of the possible applications—a new range of flat-element heating tapes will be of the utmost interest. There are three types and each has variants with different loadings. All incorporate a flat, slightly corrugated metal-foil element with outer insulating and protective covering. Type A is suitable for heating up to 110°C and is available in lengths from 12 ft to 100 ft and loadings up to 3 kW. Type E is similar to A, but has a glass-fibre outer cover. Type G has a maximum operating temperature of 450°C and is available in lengths from 6 ft to 70 ft in loadings up to 3½ kW. Full details of the range with advice on planning an installation is incorporated in a folder which will be forwarded on request. *Midland Electric Installation Co., Cyprus Wks, Upper Villiers St, Wolverhampton.*



Three of the Hotfoil heating tapes: above Type A, centre Type E and below Type G

The attractive carton which houses the Harvey Hubbell electrical accessories

Accessories for industry

THE selection from the extensive range of Hubbell wiring devices of American design and manufacture, which is now becoming available in Britain, is rapidly expanding. Many of the products are already in production here and will be marketed in the attractive carton which is shown on this page.

Apart from the standard lines of "Twist-Lock" two- and three-pin plugs and sockets, which firmly lock into place by a slight twist of the plug in the socket, the same products are available in "Insulprene" for use in marine or chemically impregnated atmospheres. Covers, also of "Insulprene," can be supplied to both plugs and sockets, making them completely waterproof. The Hubbell "Presswitch" is also available with a completely waterproof "Insulprene" oversheath. Details of other lines now ready for the UK market will be supplied on request. *Harvey Hubbell Ltd., Knoll Rd, Camberley, Surrey.*

A.C. load detectors

A RANGE of load detectors for a.c. circuits which will operate instantly on light loads yet carry heavy currents without damage are now available from Londex. Bearing type Nos. KR/CH and SSR/CH, they comprise a saturable choke working in conjunction with a sensitive relay, operated by the voltage drop across the choke. The units are complete with their own rectifier and capacitor. Typical uses of the detectors are to control the starting up and shutting down of diesel generator sets, control of exhaust fans on a common flue serving a number of incinerators or other electrical plant. *Londex Ltd., Anerley Rd, London S.E.20.*

New blowers

USING their well-known range of f.h.p. motors as the basis, Parvalux Ltd. have introduced three new blower units with a wide application for industry. The first, the SD26, moves 32 cu ft/min against a head of 0·1 in. w.g. at 1,380 r.p.m. or 75·5 cu ft/min at 2,500 r.p.m. The SD27 moves 58½ cu ft/min at 0·1 in. w.g., 1,400 r.p.m. or 120 cu ft/min at 0·2 in. w.g., 2,800 r.p.m. The SD28 moves 97½ cu ft/min at 1,400 r.p.m. or 245 cu ft/min at 2,800 r.p.m., both against a head of 0·2 in. w.g. Further details are available from the makers on application. *Parvalux Ltd., Wallisdown, Bournemouth, Hants.*

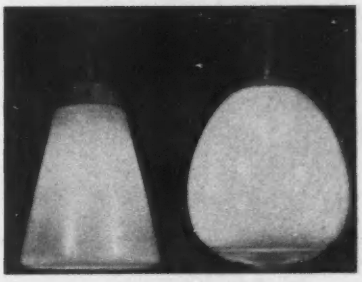
American air purifier

CURRENTLY being imported from America is a domestic air purifier which uses activated charcoal. Selling at approximately £37, the unit, known as the Wright "Bell-Air," operates by a system of drawing stale air through activated charcoal, a medicated filter and a water filter. It has adjustable louvres and operates from mains supply. The unit was on show at the recent Clean Air Exhibition at Brighton. Importers: *Smith, Bell and Co. (London) Ltd., Marlon Hse, Mark La, E.C.3.*

Lighting fittings for offices

IN anticipation of the new Offices Act which will come into force at the beginning of 1962, many lighting manufacturers are overhauling and extending their range of fittings to meet the demand which will arise as occupiers set out to raise their lighting standards. Benjamin Electric, whose Bencolite opal glass fittings are among the most widely used in commercial premises for tungsten filament lighting, have redesigned the acorn and pumpkin shapes of opal diffuser and have extended the range by the addition of new models. In each case the fitting is available as a pendant or for ceiling fixing. Where considerable moisture may be present, as in canteens, washrooms and corridors open to the outer atmosphere, the "WS" fittings are particularly suitable. The spherical three-ply opal globe has a screw neck which engages with a mating screw in a porcelain gallery housing the lampholder, which is also of porcelain.

For the high executive office or boardroom where some luxury in surroundings may be expected, the well-known "Anolier" indirect lighting unit is suitable and has been added to the range of office lighting fittings. For the office where a changeover from tungsten filament to fluorescent lighting is planned, there is also the comparatively new range of "Litemaster" and "Skyline" fittings to choose from. *Benjamin Electric Co., Brantwood Rd, Tottenham, London N.17.*



Two fittings in the Bencolite range. Both are for suspension fixing

Low price cleaner

AT a time when costs are rising, Goblin have introduced a cylinder vacuum cleaner at a lower price than might be expected. It sells at 12 gn including purchase tax. Known as the Goblin 14, the unit is equipped with a carpet tool, floor brush and crevice tool. It has a 300 W motor and multi-stage fan controlled by a foot switch. The casing is constructed of metal with finish in Venice red with cream ends. *Goblin (BVC) Ltd., New Bond St, W.1.*

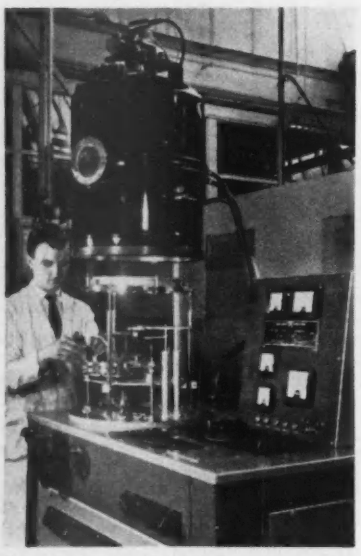
H.R.C. current limiters

LINE EQUIPMENT LTD. announce an extension to their range of h.r.c. current limiting fuse links as a result of recent extensive field tests. The full range available to date is listed in two new publications, 15-LF and 19-LF, the former being designed for operation in air and the latter under oil, or in air in metal-clad switch fuses. *Line Equipment Ltd., 71a Queen Victoria St, London E.C.4.*

New vacuum coating models

FIVE new models of "Speedivac" vacuum coating plants are announced by Edwards High Vacuum Ltd. To be known as the 19E series, each incorporates a hydraulic hoist for the new stainless steel chamber, a 400 A l.t. supply and a shutter to effect immediate termination of evaporation. Model 19E2, replacing the 18E4, is complete with unpierced spherical workholder, ion bombardment cleaning equipment and a radiant heater located at the top of the workchamber. It is designed for single layer anti-reflection coatings, or other films, on small components.

Model 19E3 replaces 19SE4 and is intended primarily for sputtering duties, being provided with a 14 in. dia water-cooled cathode.



One of the new Model 19E vacuum coating units in the "Speed vac" range

Model 19E4 is for sequential evaporation of more than one material on to small flat surfaces, and Model 19E6, replacing 19VE5, is for uniform coating of small or large plane surfaces. An alternative replacement is Model 19E7, which also features water-cooled sector cathodes for sputtering.

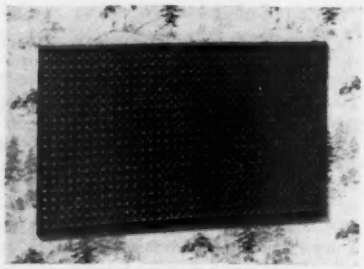
All models incorporate ion bombardment cleaning equipment and can be fitted with the "Speedivac" modulated beam photometer for the measurement of film thickness during deposition. It is standard with 19E6 and 19E7 and as an accessory to other models. *Edwards High Vacuum Ltd., Manor Royal, Crawley, Sussex.*

Solid frame d.c. motors

HEAVY duty motors, electrically interchangeable with mill-type motors in the "600" series, but with solid, instead of split, frames are announced by Laurence Scott and Electromotors. The new range, to be known as "Dreadnought," will be made in sizes up to 200 h.p. and will be available either as totally enclosed or force-ventilated. Full details of the machines are given in publication 168. *Laurence Scott and Electromotors Ltd., Publicity Dept., 376 Strand, London W.C.2.*

Small sectioned reflectors

DESIGNED mainly for installation where space is restricted are a series of small sectioned reflectors which are said to be particularly suitable for shop window and display-case lighting. They are supplied in intermediate lengths from 18¾ in. to 60¾ in. and reflecting surfaces are brightened and anodised to give better light distribution. Reflectors are provided with ¼ in. holes for conduit entry and ½ in. holes for tube or adjustable arm suspension. Plastics sealing bushes are supplied to cover unused holes. The reflector is said to be easily detachable for erection and access to control gear. Prices range, according to size, from £4 9s to £7. *Linolite Ltd., Baker St, W.1.*



Unusually finished is Belling's "Olympic" background heater

Panel gives background heat

INTENDED for the provision of background heat, the "Olympic" panel heater is supplied in both wall-mounting and free-standing versions. These units have thermostatic cut-out control, permitting a full range of heat and preventing surface temperatures from rising above a safe level. Both models are loaded to 1 kW and have infinite heat variation. The panels are 35¼ in. wide by 20¾ in. high by 1⅞ in. deep, and the wall-mounted unit projects only 2¼ in., including brackets. With the addition of feet, the free-standing unit stands 24¼ in. high. Price for both panels, including purchase tax, is £21 12s 7d. Finish is in a bold textured relief in grey, old gold or dark bronze. *Belling and Co. Ltd., Bridge Wks, Enfield, Middx.*

Lanterns give flashing signal

TWO new safety lanterns which incorporate red flashing warning lights have been announced by Pifco. The larger of the pair, known as the "Senior" model, is powered by a 6 V cell and uses 5·2 V prefocus and 6 V flashing bulbs. The flashing warning light is on an extending arm, which can be adjusted either in the horizontal or vertical planes. The smaller "Junior" version uses four large unit cells and similar sized bulbs to its counterpart. The "Senior" model sells at £1 8s 11d and the "Junior" at 15s 1d. Both prices include purchase tax and batteries. *Pifco Ltd., Watling St, Manchester.*

TRADE PUBLICATIONS

AMPLIVOX.—Illustrated leaflet describing new range of Amplilite headphones and headsets. Amplivox Ltd., Beresford Ave, Wembley.

DIMPLEX.—Leaflet describing pressed steel and copper water radiators. Dimplex Ltd., Millbrook, Southampton.

EDISWAN.—Series of catalogue leaflets describing triodes, rectifiers and thyratrons. Industrial valves and cathode ray tubes, temporary catalogue. A.E.I. Ltd., Radio and Electronics Components Divn.

E.E.—Pamphlet detailing switched (Mho) distance scheme. Meter, Relay and Instrument Divn., English Electric Ltd., Stafford.

EQUIPMENT AND SERVICES.—Brochure describing service and equipment offered by Equipment and Services Ltd., Bush Fair, Harlow.

G.E.C.—Semiconductor device guide. G.E.C., Semiconductor Divn., Hazel Gro, Stockport. Leaflet giving details of new ring main unit, Type DDFA. G.E.C. Ltd., Engineering Group, Erith.

GRAPHITE PRODUCTS.—Eight new publications dealing with applications of company's products. Graphite Products Ltd., Wandsworth Park, S.E.18.

I.A.C.—1961 illustrated catalogue of mercury switches. I.A.C. Ltd., 10 Chase Rd, N.W.10.

RANCO.—Leaflet describing "G" series of thermostatic switches. Wilcolator Divn. of Ranco Ltd., Cheam Common Rd, Worcester Park, Surrey.

SOFONO.—Illustrated booklet for heating season, detailing range of radiant and infrared heaters. Sofono Electrical Divn., Federated Foundries, Stratford Pl, W.1.

SPENCER TAYLOR.—Leaflet detailing Mk. II calculator for metal and plastics industries. Distributors: Gill Bros. and Ptnrs. Ltd., Victoria St, S.W.1.

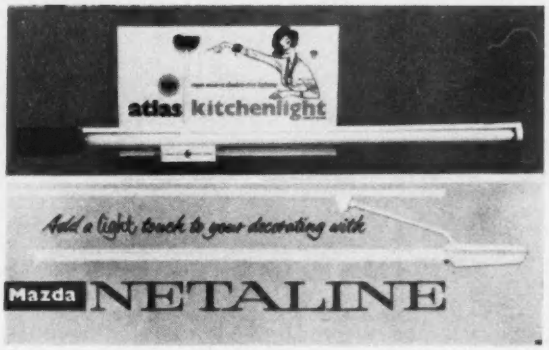
THERMODARE.—Leaflet, illustrated, giving details of varying heating appliances by Thermodare (G.B.) Ltd., Petty France, S.W.1.

Lamp publicity campaigns

ADVERTISING ON TV AND IN THE PRESS

SIX major lamp manufacturers are now launching into their winter campaigns of lighting publicity with advertisements booked in national newspapers, magazines and television. In general, themes are similar to those emphasised during the year and there are no startlingly new designs or promotional ideas.

An all-out Netabulb campaign with television, point-of-sale and direct mail backing is featured in the Mazda campaign by AEI Lamp and Lighting. Incorporated in this sales drive are the Netaline, Plus Lamp and Kolor-rite fluorescent tubes. All promotional material is hinged on the slogan "You can't beat a Netabulb." Backing this is the even neater Netabulb, a 40 W lamp with a diameter of only 50 mm. This is a smaller size, for the original 40 W lamp previously manufactured is an identical 55 mm envelope to the 60 W version. All these products are featured in direct mail material "Mazda Market —Best Sellers 1961" which is sent to 35,000 retailers, wholesalers, contractors and area boards. Point-of-sales leaflets support sales of the Plus Lamp and Kolor-rite while the booklet "Go Gay with Mazda" has been revised.

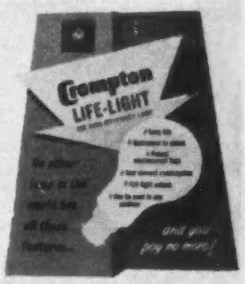


Above: display card for the Kitchenlight produced by Atlas. Below: Mazda's Netaline three colour pelmet for shop windows

Using the same basic principle as last year—presenting the inside story of lamp design and manufacture— Crompton Parkinson, have, in the main, chosen the national news press as their advertising medium. Special showcards and sales aid literature have been designed for the recently introduced Golden Crompton Lamps, while the Life-light and Newshape lamps are also being featured. At point of sale, there is an attractively presented cut-out showcard in multi-colour. Another well-designed card in four colours is intended as a window centrepiece. Feature of this display is an acetate bulb surrounded by labels drawing attention to the internal construction of the lamp.

Principal feature of Atlas advertising plans is promotion of fluorescent lighting, with the slogan "Atlas Fluorescent Lighting for All" showing the wide range of products for commercial, industrial and domestic uses. Prospective customers have been divided into five distinct groups for the purposes of advertising which is to be carried out in selected national newspapers, limited circulation magazines and technical journals. The sales story is adapted to suit the probable needs of each group, but in general it explains to large users the economic advantages of the Super 8 circuit in conjunction with the Atlas A plan. To smaller and domestic users, features of the Popular Packs, Kitchenlight and A plan fittings are stressed. Although the main weight of advertising in this campaign is on fluorescent lamps, considerable support is given to other products such as GLS and the photographic lamps.

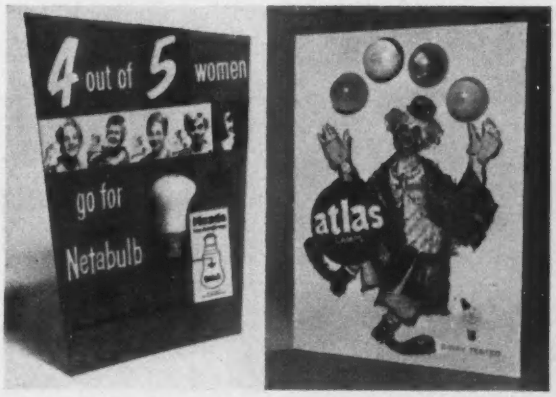
Philips are giving extra promotion to domestic lighting in the north west England area, with emphasis on their Fantasy lamps. Ninety-eight spots on wayside advertisement hoardings have been booked, and 16 sheet posters will be used on these with the central theme of "So Many Different Lamps, So Many Household Uses.' Throughout the remainder of the country they are selling with the slogan "Go Gay With Gala." Another theme on which they are selling is "Philips For The Family."



Crompton's small free standing showcard for counter and window display

"Working For Tomorrow" is the theme on which Cryselco have based their winter publicity campaign. To boost their products they have produced a 36-page booklet of lamps and fittings for the 1961-62 season.

Not unexpectedly, GEC are concentrating their campaign on the recently introduced Filta-lite. They have colour coded the lamp sleeves in their various loadings, and wire dispensers for the cartons are available for retailers.



Left: The well-known Mazda Netabulb showcard with provision for lamp and carton. Right: The Atlas clown juggling with multi-coloured lamps

PROBLEMS AND PRACTICE

We welcome contributions to this feature; those published will be paid for at our standard rates. There must be many problems encountered in day-to-day electrical work, or useful ideas or tools devised to facilitate tasks; all make instructive reading.

Mystery Trip

A THREE-PHASE 12½ h.p. induced draught fan motor was of the slip-ring induction type and after an overhaul, in which the wiring between motor and starter was renewed, trouble ensued about twice a day, the breaker tripping on overload after the mid-morning break and again after the midday break. I was assured that the wiring was in order and had been checked.

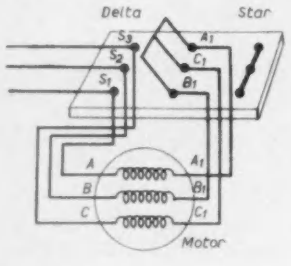
It was arranged that I should call during a midday break as I was most interested in this mystery of tripping and had no inkling as to the cause.

After switching off I took a meter on to the fan platform and removed the slip-ring covers. Lifting the brushes I had the current switched on and tested across the slip-rings for open-circuit voltage. There was no reading. Opening the main terminal box I again tested and found that the mains had been connected to the slip-ring brushes and the starter to the stator winding. Interchanging the connections and starting-up the motor, it was checked for overloading with the dampers fully open and, as one would expect, there was no further trouble.

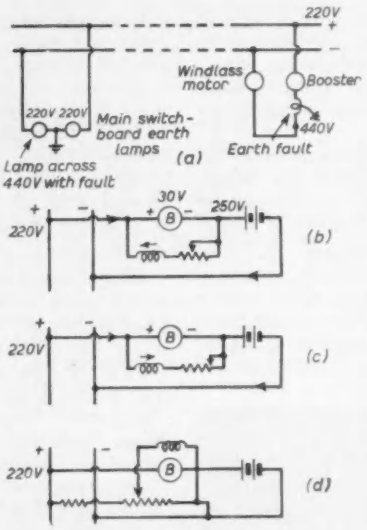
So all it turned out to be was a little carelessness in re-connecting after the overhaul and even more carelessness in checking the connections after the trouble was experienced.—*"Fivamp."*

Simple Star-delta Starter

IN an electrical workshop we had to test some 400 V three-phase motors but no star-delta starters were available. We did, however, happen to have a three-pole changeover switch which we connected as shown in the diagram to form a practical star-delta starter, but this leaves the motor windings alive in the central "off" position. A three-phase switch-fuse of suitable rating in the incoming supply leads provides the necessary isolating and protective facilities.—*M. M. Turabi.*



A simple star-delta starter from a three-pole changeover switch



Two unusual faults on marine boosters. Above, an earth fault causes indicator lamps to blow. Below, a case of reversed polarity and its cause

D.C. Booster Troubles

THE following problems were encountered on marine 220 V d.c. installations using booster control.

The first complaint was that one of the two earth indicator lamps on the main switchboard would blow violently, usually when the vessel was entering or leaving port. As the lamps were rated at 220 V 15 W, this was most mystifying. After checking insulation resistance on most of the electrical equipment in use, a dead earth was found on the bottom interpole of the booster generator used for windlass control. This was always in use when mooring so it explained the timing and frequency of the trouble. As the diagram shows, the lamp was subjected to the full 440 V as a result of the earth fault.

On another occasion a 0-40 V booster was used for charging a 220 V battery from a 220 V d.c. supply. On several occasions it was found that the polarity of the booster had reversed and it was acting as a negative, instead of positive, booster. The winding was shunt, interpole and a reversal of armature current was ruled out. The operator said that, quite often, when the battery was discharged, he could get sufficient charging current for a period with the booster at "minimum volts." It then became apparent that this was the source of the trouble as the drop across the armature was of reverse polarity in this condition. It passed a small current through the shunt winding and so reversed the residual magnetism. The diagrams "a" and "b" show how this was possible. The solution was to excite the field separately as in "d."—*W.J.S.*

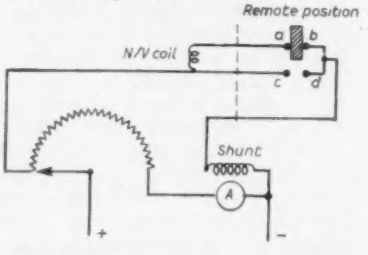
Mains Faults

PERSISTENT tripping of an earth current limiting breaker in an l.t. substation feeding a residential area was, with difficulty, traced to a service joint supplying an unoccupied show house on a speculative builder's estate. The pathway was opened-up and the service joint broken down for examination, but the fault appeared to be on the service cable. Only then were the keys obtained and the house entered. The fault was on a cooker with a heating element "down to earth" close to the neutral, but the neutral fuse in the main switch was blown. It was of course in the days before solid neutral connections were adopted.—*Ion.*

Marine Trip Trouble

IN regard to the article under the above heading (14 Sept.) an alternative method is available to demagnetise the no-volt coil from a remote position. As the diagram shows, no resistor need be used.

The remote stop-button is so designed that, in the normal position, contacts "a" and "b" are short-circuited to connect the no-volt coil in series with the motor field coil. To demagnetise the no-volt coil, the button is pushed in to short "c" and "d" maintaining, for a small period, that across "a" and "b." Further movement of the button breaks contact between "a" and "b" to open-circuit the no-volt coil feed. By this method the no-volt coil is de-energised with the minimum of sparking at the stop-button contacts but three wires must be taken to the remote position instead of the two used by your contributor.—*Jaycam.*



Another form of remote trip circuit for a motor

News of the Week

ARON QUIT METER BUSINESS

Sale of goodwill to Ferranti and change of name planned

ONE of Britain's oldest-established meter manufacturers has decided that the grass is greener in other fields. In a surprise announcement last week, the chairman of Aron Meters Ltd., Mr E. D. A. Herbert, revealed that agreement has been reached for Ferranti Ltd. to pay £400,000 for the goodwill of the meter business, together with £40,000 for certain related trade marks, patents and tools and the company's investment in Aron Meters (Ireland) Ltd.

Aron shareholders are not being asked specifically whether they agree to the sale of the meter business, which still accounts for two-thirds of Aron's activities, but they will have an opportunity to vote one way or the other at an extraordinary meeting on 3 Nov. The deal is contingent upon the company changing its name, and on that date shareholders will be asked to approve the title "Astaron Electronics Ltd." The name Aron Meters Ltd. would be applied to a new Ferranti subsidiary.

Clearly, the move has been well planned by the Aron board. They have been actively pursuing a diversification programme of late to the extent that coin-operated timers for pay-TV, timers for domestic equipment, electronic summation installations and other electronic and electro-mechanical devices now account for one-third of the business. Meanwhile, their bargaining position has been improved by converting an isolated loss three years ago into a reasonable profit and achieving record turnover in meters last year. Several months of negotiations have brought the proposals to the present stage, and the board reassure shareholders that they have no shares or other interests in Ferranti.

Economies of Scale

In a letter to shareholders, Mr Herbert says "a company can only hope profitably to continue in the meter manufacturing business if it can very substantially increase its scale of manufacture." This contention is supported by the terms of the present deal itself. Effectively, Ferranti are paying £440,000 to increase the scale of their meter production, both by reducing the number of competitors and acquiring Aron's goodwill. Astaron Electronics would retain both the existing personnel and the bulk of the present meter plant, turning them to other purposes. The deal will probably also look good to Aron shareholders because goodwill is not valued in the books. Into the bargain, Ferranti have offered to provide sufficient electronic and electrical sub-contract work to tide Astaron over the transition period. If the proposal succeeds, as seems highly probable, Astaron Electronics will have little resemblance to Aron Meters as known hitherto, for the company is in the throes of transferring some operations from Kilburn to Aylesbury. For the present, however, there will be no change in the conduct of the meter business, which will continue at Kilburn.

Ferranti, who state that they are now the UK's largest meter manufacturers, say the acquisition would enable them eventually to concentrate production on one basic type of meter for each tariff service.

B.I.C.C. RE-ALIGN TELCON OPERATIONS

NOW that land cable operations of the Telegraph Construction and Maintenance Co. Ltd. (Telcon)—a member of the BICC group—have ceased, it has been decided to incorporate the remaining activities of Telcon at Greenwich with those of Submarine Cables Ltd., in which AEI and BICC have 50% interests.

The new arrangement, which has already been implemented, will enable improved production facilities to become available at the Greenwich site. All the mechanical and electrical engineering activities of Telcon, with the exception of Telconnectors, will be continued at Greenwich under the Telcon name, including a wide range of first-class marine and other engineering equipment. The other existing activities of the Engineering Division of Telcon, covering general factory services and maintenance of all parts of the Greenwich and Erith factories, are also being transferred to Submarine Cables Ltd.

Why not 10-year test for wiring?

A TEN-YEAR test for domestic wiring installations, as for cars, was suggested at the meeting of the Yorkshire Electricity Consultative Council, in Sheffield, last week. Mr F. L. Parkin, of Rotherham, who put forward the idea, said he had come across instances where the wiring was not just bad, it was appalling. He agreed that landlords and tenants might not like the cost of any necessary rewiring, but it would have to be faced.

The Council were discussing a report on wiring installation submitted by a sub-committee, which pointed out that the Yorkshire Electricity Board tested installations before connection to check earthing. But the sub-committee considered that something should be done to draw the consumer's attention to the possibility of faulty wiring and the dangers which might arise. "Just as a patient has a periodic check-up by the doctor, so it might be suggested to the consumer that a periodic check of the wiring would be helpful and perhaps necessary," they add.

The report is being circulated to district committees of the Council for their observations.

Office Lighting Week

NEXT week is Office Lighting Week. Initiated by the British Lighting Council, its aim is to draw attention to the need to improve office lighting, particularly in small offices, in view of anticipated legislation.

Retail Sales hold

THE level of retail trade, at least, is vindicating Mr Selwyn Lloyd's policies. Preliminary BoT estimates show that retail sales in September were the same as in July and August. This is 5% higher than a year ago, but the bulk of the increase is due to higher prices.

ALLEN WEST EXPAND TO N. IRELAND

THE factory at Newtownards, Co. Down, which is being vacated this week by Lee Guinness Ltd. is being taken over by Allen West and Co. Ltd. Along with the premises, most of the plant has been acquired, and the factory will be immediately switched to the assembly and wiring of standard Allen West contactor panels. With an area of 56,000 sq ft, Allen West say the additional factory will ease pressure on the works at Brighton, where considerable developments are already under way, including the erection of a new factory at East Moulsecoomb.

On the personnel side, continuity of employment is being offered to the existing Lee Guinness employees, and it is not intended to transfer permanently any of the Brighton staff to N. Ireland. It is hoped that the works manager will be a local appointment and factory strength is expected to reach 400 in three or four years' time. The acquisition makes no difference to the arrangement whereby William Reay (Belfast) Ltd. represent Allen West in N. Ireland.

A 40 kVA alternator rotor assembly on test at English Electric's aircraft equipment division, Bradford. Machines like this provide a constant frequency supply for aircraft, when used with a constant speed drive such as the company's Sundstrand

Sea-front Lighting at Jersey

SPECIAL street lighting has now been installed along Jersey's sea-front, where the annual "Battle of Flowers" takes place. This provides facilities for the decorative features, eliminating the need for the former temporary substation and o.h. distribution system. The lighting fittings are two twin 5 ft 80 W GEC lanterns on 30 ft galvanised octagonal steel columns. On four of the column faces are outlets, which can be blanked off flush when not required. The control panel door is 2 in. longer than standard, and the interior houses a water-tight box with three-phase and neutral busbar compartment and three fuses; also an isolated 10 A single-phase switch which can extinguish the street lights when the festival lighting is in use. The 15 A fuses control temporary wiring for the "Battle." Along the first 1,500 yd of the route 0·1 sq in. four-core cable supplied by Pirelli-General has been installed.

Computer intelligence only beginning

ALTHOUGH computer technology has advanced so quickly in recent years, there is still expectation of higher speeds of operation and of a denser packing of decision and storage elements. This is made clear by Mr W. S. Elliott, M.A., F.INST.P., M.I.E.E., in his address as chairman of the IEE Measurement and Control section. He also forecasts that the increasing "intelligence" of machines, such as the ability of a machine to interrupt a routine task to deal with an emergency, is only just beginning.

All intermediate and large electronic computers at present use a ferrite core for their main store. This device has reached its limit of speeds of one- or two-millionths of a second. The thin magnetic film memory now being developed in the UK and elsewhere promises speeds up to ten times as fast, but it poses a severe problem in sensing a low level output at high speed.

An exciting new device becoming available is the cryotron. It works like a relay, and takes no power except when it is being switched from one state to another. Ten million cryotrons switching simultaneously at a rate of a million times a second would take only 1 W of power; and the device is so small that an Atlas computer based on it might occupy 1 cu ft. But the cryotron must be cooled in liquid helium.

Cryotrons are made by evaporating thin films of tin and lead on to a glass base, in a vacuum. Intensive studies of the materials used for these devices is proceeding at the NPL and in the research laboratories of some firms.

Looking far to the future, workers at the Stanford Research Institute in California have thought out ways of making a 1 in. cube computer containing 100,000 million decision elements. They propose to build it by evaporating different materials in a vacuum and etching the layers to make up the circuit, the etching being effected by an electron beam. A resolution of one millionth of an inch is claimed for the etching process.

B.S.T. Revision

IN our summary of the revised CEGB bulk supply tariff, an incorrect account of the requirements for a "special consumer" was given. There is no limit placed on the "nominated firm kilowatts" of the consumer; but the difference between this figure and the recorded half-hour maximum demand must be at least 25,000 kW.

OFFICIAL PUBLICATIONS

Gas Council Report and Accounts 1960-61. HMSO. 9s 6d (see page 587).

Long Term Demand for Scientific Manpower. Report of Committee on Scientific Manpower. HMSO. 1s 9d (see page 585).

Council for the Preservation of Rural England. Report for 1960-61.

List of Sandwich Courses and Block Release Courses. HMSO. 6s.

ERA Publication:
O/T26. Current-carrying Capacity of Base Aluminium, Aluminium Alloy and S.C. Aluminium Conductors for O.H. Power Transmission, H. Goldenberg. 5s (see page 560).

BS 3396. Woven Glass Fibre Fabrics for Plastics Reinforcement. Part 3. Finished Fabrics for use with Polyester Resin Systems. 4s 6d.

BS 1452. Grey Iron Castings. 5s.

BS 3425. Measurement of Noise Emitted by Motor Vehicles. 3s.

BS Amendment Slips:
52, Dimensions of Bayonet Lampcaps, Lampholders and Lampholder Plugs for Voltages Not Exceeding 250 V, PD 4294; 269, Rules for Methods of Declaring the Efficiency of Electrical Machinery (Excluding Traction Motors), PD 4271; 415, Safety Requirements for Radio or Other Electronic Apparatus for Acoustical or Visual Reproduction, PD 4257; 941, Automobile Filament Lamps, PD 4292; 1164, Dimensions of Pre-focus Lamp-caps and Lampholders for Voltages Not Exceeding 250 V, PD 4266; 1875, Bi-pin Lamp-caps and Lampholders for Tubular Fluorescent Lamps, PD 4272; 52, Supplement No. 1, B.22 Bayonet Cap Lampholders of Moulded Insulating Material, PD 4295.

A "Sparks and Spuds" quiz—how to cook them—and an appliance display never bettered are only part of the attractions at S. Scotland Board's pavilion at Glasgow's Modern Homes Exhibition. Here a mannequin displays readily washable fashions, and there are children's cooking competition finals. Entertainment and TV coverage are added for good measure

1962 CIGRE CONFERENCE

THE timetable for the next conference of CIGRE, in Paris from 16 May to 26 May, 1962, provides for subjects related to transformers and teletransmission to be dealt with on Thursday, 17 May, and at the first session on 18 May. Saturday, 19 May, will be devoted to circuit-breakers and capacitors, and Monday, 21 May, to cables and substations. Insulation co-ordination and insulating oils are the subjects set aside for 22 May, and the following day will be devoted to technical visits.

SURPLUS SCIENTISTS AND ENGINEERS AFTER 1965

BY 1966, there may be more scientists and engineers available to employers in the UK than they immediately require. This is predicted by a committee of the Government's Advisory Council on Scientific Policy, in a report published last week. However, the supply-demand position will vary from one type of technology to another.

No indication is given in the report of how electrical engineers may stand in this employment prospect. And unless the prospect be regarded as too gloomy the report points out that a surplus over immediate requirements will permit those trained in science and technology more readily to enter management, administration and the professions generally. In general terms, it seems that by 1965 a slight surplus of scientists may be balanced by a slight continuing shortage of technologists.

The detailed forecasts given in the report are that, by 1970, there will be 8,800 scientists surplus to a demand of 140,500, and about 8,600 technologists surplus to a demand of 188,000.

In the course of their calculations, the committee have looked into the likely increase of employment of scientists and technologists in electrical engineering, including electronics. They conclude that the proportion of all employees in this industry who fall into those categories will rise from the 1959 figure of 2·2% to 4% by 1970. This view is also held by what are called "some of the largest concerns in the industry." This is a proportion thought likely to be exceeded only by chemicals and oil refining (8%) and aircraft manufacture (5·5%). The 1959 USA ratio for the electrical engineering industry is 7·6%; but this is thought to include some who are of lower technical standard than would qualify for inclusion in the UK statistics.

Employment of technicians in UK electrical engineering in 1959 is put at 14·5%, compared with 13·1% in the USA.

E.T.U. Appeal in 1962

THE appeal by the five men named as conspirators in the ETU High Court action earlier this year is to be heard as early as possible in the sittings beginning 11 Jan. next. This was decided by the Court of Appeal on Monday. The five are: Mr F. Foulkes, Mr F. Haxell, Mr R. G. McLellan, Mr J. N. Frazer and Mr J. Humphreys.

Seeking the early hearing, Mr G. Gardiner, Q.C., for the plaintiffs, Mr J. Byrne and Mr F. Chapple, said no one in the union knew what the position was until the appeal had been disposed of. The five defendants were saying, in effect: "You cannot do anything against us. We are appealing and the matter is *sub judice*."

An application by the plaintiffs to extend the time to serve notice of cross-appeal was also granted. They seek to have further evidence admitted and for the judgment to include Mr G. Scott, a national officer of the union, who was cleared of conspiracy at the earlier trial.

APPLIANCES SELL WELL

ACTIVITY in service centres subsided considerably in August, as an aftermath of the pre-Little Budget rush, but taken as a whole sales still compared favourably with August, 1960. Refrigerators in particular continued to be unusually strong sellers for the time of year, though unable to match the 30,938 sales recorded by the area boards in July, but the warm weather which helped in this sector once again had the reverse effect on clothes dryers.

Appliance sales by area boards	Sales in month ended 31 Aug., 1961		Sales in 12 months ended 31 Aug., 1961	
	Total	% change over corresponding month of 1960	Total	% change over previous 12 months
Cookers ...	26,944	+ 2·0	352,231	+ 3·9
Water Heaters:				
Immersion	16,941	+ 1·8	194,670	+ 2·2
Storage ...	4,440	−14·2	62,787	− 7·1
Washboilers	4,207	− 7·3	54,079	− 9·7
Washing Machines ...	7,943	+ 2·1	104,482	−21·9
Refrigerators	10,318	+12·7	141,018	− 3·9
Clothes Dryers ...	1,676	−40·8	52,741	not avail.

OVERSEAS WELDING DEVELOPMENTS

WELDING developments in foreign countries will be outlined at an advanced course for welding engineers in London next month by visiting lecturers from France, Germany, Belgium and the Soviet Union. Organised by the School of Welding Technology, the course will generally be confined to the welding of ferrous materials and will be of specific value to welding engineers concerned with heavy fabrication.

Being held from 13 Nov. to 17 Nov., the course is restricted to individual members of the Institute of Welding and to welding engineers of companies which are corporate members.

Radio Boom Continues

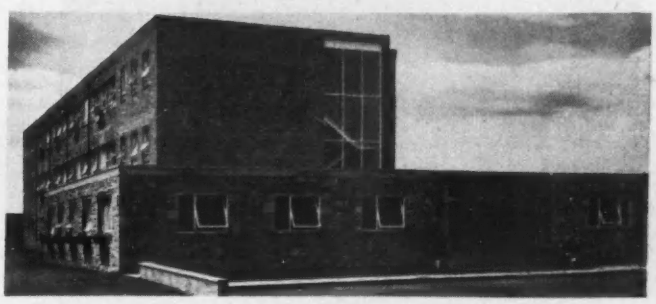
THE transistor boom in radio sales, first apparent in June, continued in July and August, latest figures from RTRA show. Not surprising in view of the rush to beat the Chancellor's p.t. surcharge, the peak came in July when sales of radio sets reached an average of 26 per shop, which has probably never been exceeded and compares with 16·2 a year earlier. In August the average slipped back to 20·9 against 16 in August, 1960, but this was still high in relation to the average of 12 in May this year, before sales suddenly doubled in June.

Television continues to have the edge on last year, but traders still regard turnover as less than normal. July's average was 5·6 sales per shop (4 a year earlier) and August's 5·4 (5·5). Sales of tape recorders are edging up gradually, and reached 1·7 in August.

FERRANTI'S NEW ELECTRONICS LAB.

A HIGH-VOLTAGE transmission line current indicator is among a number of devices under development at the new Ferranti electronics laboratory at Silverknowes, Edinburgh, officially opened by Sir Vincent Z. de Ferranti, chairman of the company, last Thursday. This new device will enable currents in the lines to be measured remotely by the use of a transistorised detector, which is clamped to the h.v. line itself and is coupled electromagnetically to a metering circuit on the ground. Built at a cost of £175,000, the three-storey building has about 35,000 sq ft of floor space, housing the Applied Electronics Dept., under Mr J. Stewart. A trunking system with four outlets/50 sq ft has been installed throughout the laboratories, and 50 cycle supplies are obtainable from a busbar trunking system.

Although primarily employed in the development of radar and other systems for the Services for both airborne and ground use, the department is also engaged on a variety of other projects for various industries. These include an experimental teaching machine and a train-detection system.



Exterior view of the new Ferranti electronics laboratory at Silverknowes, Edinburgh, officially opened last Thursday

NUCLEAR POWER REACTORS

A NEW UKAEA film in colour, "Nuclear Power Reactors," has just been released, giving a survey, largely by means of animation, of power reactor systems both in operation and under development. It traces British achievements from the Calder Hall type of reactor to the high temperature gas-cooled experiment and has been produced by G. Buckland-Smith, in association with the Film Producers' Guild. The film, which runs for 35 min, is in Eastman colour and is available on loan, free, in both 16 mm and 35 mm with sound track from the Public Relations Branch, UKAEA, 11 Charles St, London S.W.1.

The date of release coincides with the fifth anniversary of the opening of Calder Hall, since when the station has supplied 3,729 million kWh of energy to the national grid, while Chapelcross has supplied a further 2,191 million kWh. As the result of operating experience it has been possible to step-up both thermal and electrical outputs to well beyond expected levels. Today, the thermal output per reactor is 220 MW as compared with the designed figure of 180 MW and, to take advantage of this, turbines are being re-bladed to increase their capacity from 23 MW to 27 MW. With two already in commission and a third due this week, the peak of 201·5 MW from the station was reached last Saturday.

Factory efficiency conference

TO highlight some of the many factors which can contribute to the efficient factory, the British Productivity Council is organising, in conjunction with the Factory Equipment Exhibition at Earls Court, a five-session conference on 13 Nov. to 15 Nov. In addition to the conference, the BPC is co-operating with the Export Council in staging a one-day conference on 16 Nov., also at Earls Court, on "Producing for European Markets," for which the chairman will be Sir William McFadzean. The requirements which manufacturers have to meet in these markets will be outlined by a French and a Swedish business man.

1963 Microwave Valve Conference

THE Electronics and Communications Section of the IEE is organising a conference on the design and use of microwave valves, which is to be held at Savoy Pl, in September, 1963. It will be organised so as not to clash with next year's series of international conventions on microwave valves at Delft, Holland. The organising committee, under the chairmanship of Mr. A. J. Young, is inviting papers from prospective authors.

BUSINESS SENTIMENT SAGS

STRIKES, squeezes and increasing competition have had their effect on business sentiment, the latest FBI survey shows. Whereas optimism was rising four months ago, now 44% of the industrialists answering the questionnaire say they are less optimistic about the general business situation in this country, while only 7% consider that prospects have improved.

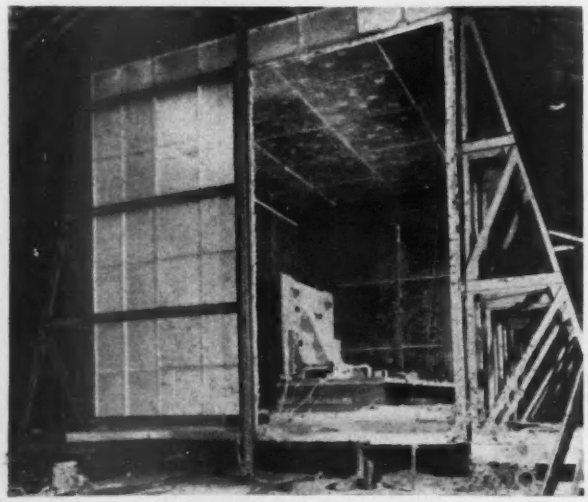
A faint suspicion is thrown on the objectivity of the replies on the general situation because it is also 7% who say their own profit margins have improved, while 50% report lower margins and 51% have surplus capacity.

Certainly the electrical industry is typical with regard to the pinch on profit margins, but is clearly better than average in the order book department, for 35% of the 686 industrialists surveyed report shorter order books than at the end of May, while only 17% have more orders. So far, new orders for capital equipment seem to have barely declined, but if the present mood prevails for long the downturn will become quite sharp. At present, 44% of the industrialists expect to spend less on buildings in the next 12 months, against 19% who expect to spend more than in the past year. The balance is not quite so unfavourable for plant and machinery, with 37% expecting to spend more and 27% less.

So much for expectations. For the time being output is slightly higher on the whole.

Largest Stress-relieving Furnace

BELIEVED to be the largest in the world, an electric stress-relieving furnace, measuring 80 ft long by 27 ft by 27 ft, is being installed at the Thornaby-on-Tees works of Head Wrightson Teesdale Ltd. The furnace will be capable of stress-relieving large fabrications such as oxygen steel converters, and will be used in the fabrication of boilers for the Dungeness nuclear power station. Designed by Cooper Electroheat Ltd., the furnace's hearth, walls and roof are constructed generally from 8 ft by 8 ft mild steel panels, which are filled with compressed mineral wool slabs. The side walls, carried by "A" frames and mounted on bogies, are easily retractable. 1,500 kW electrical elements, at mains voltage, are arranged in 40 kW units. A 40 ft length of the furnace has already stress-relieved a fabrication within limits of 610°C minimum and 630°C maximum.



First completed section of the stress-relieving furnace at Head Wrightson's Thornaby Wks, showing heavy fabrication in position on the movable floor. It has already been used for stress-relieving fabrications weighing 50 tons.

ENGINEERING WITH PLASTICS

THE use of plastics grid packing in cooling towers, and the development and application of angled condenser bushings are to be among subjects scheduled for discussion during the second day's proceedings of the forthcoming conference on Engineering with Plastics. The Conference, being organised by the Plastics Institute, is to be held at the IEE, Savoy Pl, on 31 Oct. and 1 Nov.

NO DECISION ON WARRANTIES

AT least one speaker did not pull his punches when the National Chamber of Trade's conference discussed manufacturers' guarantees last week. He described the clauses inserted by some manufacturers as a "swindle" and said this class of sharp practice would not be tolerated anywhere but in England. The conference reached no conclusion on a motion that pressure be put on manufacturers to ensure that their warranties provide for immediate repair or replacement of faulty goods returned by the customer, but referred the matter to their board of management to consider the best action to take.

. . . FEWER USE GAS

FEWER domestic consumers are using gas but the consumption of those that do has increased, say the Gas Council, whose annual report was published last week. This, they claim, results from increased sales of gas space-heating appliances, and they look for greater markets with the implementation of smoke control orders under the Clean Air Act.

Over the last three years, sales of gas space heaters and refrigerators have been climbing even in the face of stringent hire-purchase restrictions. The Council take encouragement from this trend, especially in the heating field where appliances are being given modern designs.

However, hire-purchase restrictions have caused a setback in the sales of gas cookers which, hitherto, have been readily available on simple hire or easy h.p. terms. Washing machines, wash boilers and water heaters all suffered during the year, declining sales affecting the first two quite substantially.

On the credit side, the Council report a rise in level of sales of warm-air units and central-heating systems. During the year to March, 1961, some 8,000 warm-air units and 18,000 gas central-heating appliances were installed. This is double the rate of sales of the previous year.

During the year overall consumption rose by 74·6 million therms over the previous year giving a total revenue of £236·8 million, an increase of £11·9 million and a surplus of £2 million compared with last year's deficit of £2·4 million.

In the sphere of development, the Council note that in both domestic and commercial cooker fields prototypes have been made of a burner with improved flexibility, and experiments are being carried out on the concept of a single jet to heat ovens. The use of fan-assisted combustion in instantaneous water heaters is being investigated and a simple thermostatic control device is on trial in all Gas Board areas. As with electric home laundry equipment, greatest interest is being taken in the tumbler dryer. The Council claim they have available prototypes in which the gas-heated unit is "shown to be considerably quicker in operation than its electric counterpart."

In industrial and commercial outlets the gas industry reports increased consumption; developments are keeping pace with a competitive market. Technical research is being carried out on the possibility of shipping liquid methane in specially constructed tankers from Algerian gas fields. Regarding natural gas, the Council state that the North Eastern Gas Board are now tapping supplies from two wells at Eskdale, which were first discovered in 1938. Investigations are also being carried out on the advantages of underground storage of gas at sites in Hants and Kent.

Lighting on the A48

ONE of the first lighting installations in Britain to be approved by the MoT for a road running through a non-built-up area, the lighting of a 5½-mile stretch of the main A48, Cardiff to Newport road, has been completed by AEI Lamp and Lighting Co. The section is between St. Mellons and Ebbw Bridge. The installation, which could well be a forerunner of similar schemes for the new motorways, utilises 200 W sodium linear lamps in Amberline bracket outreaches varying between 6 ft and 9 ft, mounted on 35 ft Stewarts and Lloyds steel columns at intervals of up to 170 ft, along the 40 ft four-lane road. Illumination level is 10,000 lumens/100 ft. Erection was by S. A. Inston and Co. Ltd. and maintenance will be carried out by the South Wales Electricity Board.

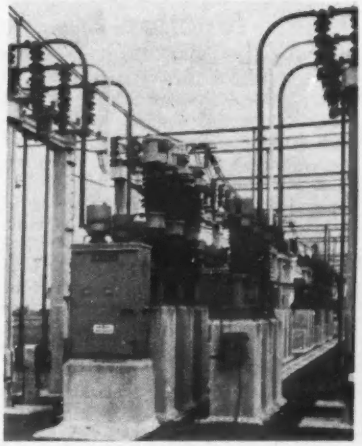
London floor-warmers' opinion sought

RESULTS are now being collated of a questionnaire among floor-warming users carried out by LEB on behalf of London Electricity Consultative Council. Around 500 local authority tenants who have had the system installed for at least two winters were selected for the survey and it is understood that replies were received from almost 100%. It looks as if the users have some rather decided views; perhaps they wanted to have their say about landlord or tenant control.

At their public meeting last week, LECC also touched on the evaluation of consultative councils' work which appeared in the latest issue of *Shoppers' Guide*. The chairman, Sir Laurence Watkinson, mentioned that as far as the London council was concerned, their first draft had been so inaccurate as to be almost offensive. Whatever was in the first draft, LECC could hardly be accused of avoiding their obligations since they are progressively circularising every one of the 1¼ million consumers in the area.

System reinforcement in N.E.

SYSTEM reinforcement by the CEGB in North East England includes the building of a double-circuit 275 kV line with three new 275/66 kV switching stations. The line, now nearing completion, goes south from Blyth to supply infeed points at West Boldon and Hart Moor, Co. Durham, and at Lackenby, near Middlesbrough. From Lackenby the line is connected into the existing Monk Fryston/Stella West feeder. A. Reyrolle and Co. are supplying the 275 kV 7,500 MVA air-blast switchgear for the West Boldon and Lackenby installations and also the 66 kV 2,500 MVA small-oil-volume switchgear ordered by the North Eastern Electricity Board for all three stations. Lackenby substation will be the first to be commissioned.



Part of the switchgear compound at Lackenby showing the 66 kV 2,500 MVA small-oil-volume Reyrolle switchgear

In the erection of the 275 kV line across the River Tees, a rocket line was first fired across the river, last week, and the nylon rope used to haul the heavier link. Supported by two 371 ft towers, the line will cross the Tees at a height of 200 ft. The River Tyne will be similarly crossed.

The work is being carried out by Balfour Beatty and Co. The cables will be able to carry up to 400 kV, with only the substation equipment needing to be altered.

ELECTRICAL STEEL SHORTAGE?

. . . S.C.O.W. Shutdown danger

THE closing down of the Abbey and Margam works of the Steel Company of Wales last week-end could cause difficulties for the electrical industry if the shutdown continues for any length of time. The company is a large supplier of electrical sheet steel, apart from normal sheets, which are used for exteriors of such appliances as refrigerators and washing machines.

The shutdown of the plants has resulted from the month-old strike of 350 bricklayers and their 700 assistants (who work on the furnaces) over the proposed introduction of new working agreements. For some weeks the company has maintained production by the use of staff men, but the AEU now regard these as "blacklegs" and have ordered their members to withdraw.

Earlier this week, attempts were being made to reopen discussions between the respective sides with a view to getting the men back to work.

Simple accidents

THE many accidents his department had investigated showed that it was the simple things that caused the trouble, Col S. J. Emerson, Senior Electrical Inspector of Factories and Electrical Consultant to the Home Office, said last week. Col Emerson was guest speaker at the Electrical Industries Club's October luncheon. In view of his direct experience, it was interesting which safety pointers he stressed most. These were disconnecting all appliances when not in use, choosing only safe appliances and, more important, having them properly installed. Avoiding accidents was a question of proper education.

The next luncheon will be held on 14 Nov.

E.W.F. Scottish function

THE annual Scottish function of the Electrical Wholesalers' Federation, held at North Berwick earlier this month, was again a complete success, with guests from seven other associations. The golf competition was won by Mr T. T. Young, with Mr J. Kerr runner-up. At the dinner, Mr G. E. McIver, chairman of the Scottish Section, proposed the health of the guests, to which Mr R. W. S. Mackay responded. Mr J. H. Hirst, president, also replied to the toast on behalf of the Council. The toast of "The Ladies" was proposed by Mr W. J. Bird, and the response was made by Mr G. Conradi.

At the conclusion of the dinner Mr W. E. Hind proposed the health of the chairman and, since it was to be his last attendance at the Scottish function, expressed his appreciation of the pleasure it had given him to attend. Earlier, many of the guests had enjoyed trips in the countryside.

Sayings OF THE WEEK

"Although I would almost rather bet on racehorses than on new types of reactors, I have no hesitation in putting my money on the nuclear field." . . . SIR ROGER MAKINS, at the Institute of Fuel annual dinner.

"There appears to be little honour in selling, especially in the lower echelons, and I feel that if the prestige of salesmen could be raised, a great deal would be done to help the cause of salesmen generally." . . . J. S. SKINNER, president, U.K. Commercial Travellers' Association, writing to *The Times*.

"We must devise means, and urgently, by which engineers at both professional and technician levels can be sent out to the developing countries on secondment to occupy positions in the public services and in education." . . . SIR WILLIS JACKSON, in his inaugural address as ASEE president.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, October 17

	£ per ton	Weekly change £
COPPER, standard class A (settlement)	230	+3
" (3 months)	231	+3¾
LEAD, refined pig, 99·97% purity (cash)	63¾	+¼
" (3 months)	64¼	+⅛
TIN, refined, min. 99·75% purity (settlement)	937	−12
(3 months)	946	−12½
ALUMINIUM, ingots 99·99·5%	186	—
" wire bars (4×4×54")	193½	—
BRASS Strip 63/37	198½	+3½
SILVER (Troy oz)	79⅛d	—

	£ per ton	Weekly change £
ZINC, virgin, min. 98% purity (cash)	72¾	+⅞
" (3 months)	73½	+¼
RUBBER, per lb		
No. 1, RSS, spot	24⅛d	−⅛d
c.i.f. basis, ports, Dec.	24 1/16d	−1/16d
ARMOURING:		
Galv. Steel Wire (0·104 in.)	68½	—
Mild Steel Tape (0·04 in.)	53½*	—
NICKEL (home)	660	—
MERCURY (76 lb flask)	62	—
AMERICAN PRICES:		
Copper, electrolytic (per lb)	31c	—
Lead (New York)	11c	—

* *Tape Price, now an average, includes varnishing*

London Heating Centre this Winter

A HEATING Centre which hopes to do for heating what the Building Centre does for building, and at the same time make money selling and installing the equipment, is due to open near Oxford Circus early in January. All methods of heating, whether by electricity, gas, oil or solid fuel will be displayed, with the accent on domestic applications initially.

To form the centre, two old-established heating firms, Pithers Radiant Stoves and London Warming, have combined. The idea stems from Pithers' 2,000 sq ft premises at 31 Mortimer St, W.1., being out of scale to the small present-day turnover in their stoves, and it is these premises which are being completely remodelled as The Heating Centre. London Warming have mainly been concerned with heating church property.

Impartiality is the keynote, so no products of Pithers or London Warming will be shown, and it is claimed that this will be the only point in Britain where such advice on all types of heating can be obtained. The principle of operating is that manufacturers will be invited to submit appliances for display; these will not be sold off the floor, but orders may be placed on the spot with the Centre's own sales staff. The oil companies are understood to be keen on the idea, gas wanted it to be exclusively gas but will take part, and electrical manufacturers are interested. Architects as well as householders are being catered for, and there will be a reference library and private offices. Conversion of the premises is due to start next month.

Sir Norman Kipping, director-general of the Federation of British Industries, during his visit to the Tsurumi Works of Tokyo Shibaura Electric Co., of Japan, talking to senior managing director, Motoji Kuno

News in Brief

The CEGB propose to dispose of about half of the former site of Ramsgate power station, probably for light industrial purposes.

Copies of the booklet "Government Buying of Engineering Products," to which we referred last week, are obtainable, gratis, from the Export Services Branch, Board of Trade, Room 801, Lacon Hse, Theobalds Rd, W.C.1.

Ascot Lamps and Lighting Ltd. recently held a sales conference, which was attended by their area sales team, in preparation for the coming lighting season.

Orders worth £1 million, from the Universities of Birmingham, Glasgow, Leeds and Liverpool, for high-speed processing systems were announced by the English Electric Co. last week.

The Kenwood group will move its headquarters from Woking to Havant at the end of the year.

An eight-week laboratory course on "Basic Transistor Measurements and Applications" is being held at the Borough Polytechnic, starting next week on Tuesday evenings, or Wednesday afternoons, and will be repeated from January. Fee is £1.

The foundation-stone laying ceremony of Churchill College, Cambridge, was performed by Lord Tedder last week-end.

Benjamin Electric Ltd. last week held the first of this winter's two-day courses for electrical wholesalers' sales representatives.

AEI Construction (Cables and Lines) Division is to carry out a £27,000 cabling contract for Belfast Corporation.

OVERSEAS NEWS

from our correspondents abroad

CANADA

Another Set

The Consolidated Mining and Smelting Co. has ordered a 90,000 kVA water-wheel generator from the Canadian Westinghouse Co. for its Waneta power development on the Pend d'Oreille River, near Trail, BC. Westinghouse supplied two similar generators for the station a few years ago. The new machine is scheduled for service in 1963.

Consultant Problem

The British Columbia Electric Co. Ltd., recently taken over by the Provincial Government, is now negotiating to purchase its former subsidiary, International Power and Engineering Consultants Ltd., or at least some part of it, we understand. This is one of the results of the Province's takeover also of the Peace River Development Co., for which project IPEC were the consultants. The latter concern is jointly owned by British Columbia Power Corporation Ltd. and Balfour Beatty and Co. Ltd., and has acted as consultants on power projects in various parts of the world.

Licence Application

The British Columbia Power Commission has now been granted permission by the Cabinet to apply for a hydro-electric development water licence in respect of the Fulton River. The project, of 20 MW capacity, involves the construction of a dam 100 ft high and 300 ft wide, to raise the level of seven-mile long Fulton Lake by about 50 ft.

MEXICO

Order for Mobile Sets

A £330,000 order for ten self-contained mobile diesel generating stations has been awarded to the English Electric Co. by the Commission Federal de Electricidad of Mexico. The sets, to operate in temperatures varying between 77°F and 113°F and at altitudes between sea level and 7,220 ft, will each consist of a 12-cylinder exhaust turbo-charged 1,356 b.h.p. diesel engine coupled to a 964 kW alternator generating at 2,400 V when running at 720 r.p.m. To be used as local sources of power some of the sets may have engines arranged to run as dual-fuel units, using natural gas. Each unit will be mounted on a trailer. The order was obtained in the face of severe international competition.

YUGOSLAVIA

Power for Mills

English Electric Co. are to supply the major part of electrical equipment (worth about £300,000) for a new pulp and paper mill to be built in Yugoslavia. The company will supply a 33 kV outdoor substation consisting of three oil circuit-breakers and a 10 MVA transformer. Power will be distributed by the main switchboard and some 21 substations and transformers in the factory. EE Co. are to provide the power distribution gear and motors for driving the process machinery. The variable speed drives include one of 850 h.p. for the paper machine, one of 80 h.p. for the pulp machine and one of 105 h.p. for the rewinder. There will also be some 380 constant speed a.c. motors.

TANGANYIKA

Plant for Hale HE Scheme

For the Hale hydro-electric scheme of the Tanganyika Electric Supply Co., the English Electric Co. has just received a £300,000 order for the supply of two 14,700 h.p. vertical Francis turbines and valves, together with two 10,500 kW generators and associated gear. To be Tanganyika's largest hydro-electric scheme, it will have an underground power station on the River Pangani, some 40 miles from the port of Tanga, and is scheduled for operation early in 1964. The power generated will be fed into the existing Tanga system and transmitted by 132 kV lines to Dar-es-Salaam and the Central Line areas. In addition, English Electric has already received an order for 33 kV substation switchgear, worth about £30,000, for the transmission network. Balfour, Beatty and Co. are responsible for the design and construction of the civil works and associated transmission line system. Cost of the whole scheme is about £5 million, of which the Tanganyika Government is advancing £1¼ million, and the Colonial Development Corporation £3 million, to the TES Co.

PAKISTAN

Transformer Prices High?

Sufficient new industrial capacity for the manufacture of hollow shaft electric motors will be installed within the next 12 months to meet Pakistan's requirements, Mr Shah Zaman, Joint Secretary of Industries, told representatives of various industries, earlier this month in Lahore. He said that the Government would provide all out facilities for setting up industrial units for manufacturing these motors, which were not being produced in the country at present. He also advised the representatives of the transformer industry to maximise their produced in the country at present. He also thought that the prices of transformers manufactured in Pakistan were comparatively higher. The industrialists explained their difficulties, and Mr Shah Zaman promised to look into them.

AUSTRALIA

South Australia Seek New Site

The Electricity Trust of South Australia has been authorised to seek a site for a new power station, with a capacity of at least 1,000 MW, on Torrens Island at the mouth of the Port River, Adelaide. This is part of the scheme for a major expansion programme for power generation in the State.

Aluminium Plant

Additional electrical plant for the second stage of the Bell Bay aluminium plant's expansion programme is now estimated to cost only some £150,000, although equipment for the first stage will cost £655,000. In addition, Aluminium Production Corporation Ltd. are soon to place a £229,000 contract for the replacement of the original rectifier plant. By replacing the original plant the company will obtain 96·7% efficiency from power consumed, compared with 93·6% efficiency from the present plant. This will increase output from the old plant's 13,000 tons to 15,500 tons. When the additional £655,000 worth of equipment to be installed as the first stage of the company's expansion programme is operating, output should be more than the 28,000 tons originally envisaged.

Station Contracts

For the new 120 MW Muja power station for the State Electricity Commission of Western Australia, to which we referred last week, the contract for the steam generating plant and buildings has been placed with Riley Dodds, Australia, Pty. Ltd. The two cooling towers will be provided by R. Werner and Co. Pty. Ltd., Melbourne, and ASEA Electric (Aust.) Pty. Ltd., also of Melbourne, are to supply two 132 kV transformers. The Commission's programme calls for the first 60 MW Parsons set to be in service by 1965 and the second by 1967.

PHILIPPINES

World Bank Loan

The World Bank has approved a loan equivalent to $34 million to the National Power Corporation of the Philippines to assist in financing a 206 MW hydro-electric project on the Angat River, about 25 miles north east of Manila, on the island of Luzon. An earth and rockfill dam is to be built, 410 ft high and 1,700 ft long. The main powerhouse will have four 50 MW sets and a secondary powerhouse, using water from a diversion tunnel, will have one 6 MW generator.

Company Activities

IN these sad times the stock market investor strongly resembles a shipwrecked mariner, grimly determined to find an object to buoy himself up yet failing in the search. The genuine demand for a prop to support investment sentiment was demonstrated by the first enthusiastic reaction to the last small reduction in Bank Rate. Alas, those tender hopes have been dashed by a rare combination of dismal news from the boardrooms and the trade association offices. The steel industry, we are told, is toiling along with output running at 77% of capacity. Immediate prospects for the textile trade are bleak. And all the while trade unionists gird themselves for the showdown with the bosses which is surely coming.

But perhaps the most disturbing cloud on the economic horizon is the steady erosion of profit margins which cuts into earnings even when sales are rising. Considerable dismay has been aroused by the passing of the interim dividend by Babcock and Wilcox and the veiled hint that perhaps there might be no final dividend either. For the market as a whole this has brought about an agonising reappraisal of "growth" stocks. Investors have watched the prospects of jam tomorrow recede into the more distant future and decided that for the moment low-yielding stocks are unattractive. The result is that "blue chips" have been among the hardest hit by the new recession in stock market prices.

More specifically, a great deal of the heartache in the Babcock and Wilcox boardroom has been brought about by lack of profits on atomic energy contracts, and this has affected some big names in the electrical industry as well. English Electric have dropped another 3s to a nadir of 26s, while AEI and GEC also have fallen to new "lows" for this year. AEI now stand at 28s 9d to yield a lavish 10·4%, while GEC languish at 24s 3d to return 8·3%. It is a far cry from the days when the heavy electrical industry was being hailed as on the threshold of a new atomic era. The movement against low-yielding shares has hit some of the more promising companies in the electrical industry. Dimplex for example have plunged 5s 3d to 82s, ICT 2s 9d to 88s 3d and Plessey 2s to 39s 3d. Yet shares like these might prove well worth picking up if prices fall much lower, for the British electronics industry in particular is expected to gain from the opportunities offered by the European Common Market. Another notable casualty among electrical stocks was Hoover, whose "A" shares dipped 3s 9d to 41s 6d on profit taking, following the speculative rise that has accompanied talk of American interest in the remaining equity. Elsewhere, Westinghouse plunged 2s 6d to 25s 6d on the announcement that the British Transport Commission has requested the company to cease production of vacuum brake cylinders under its long-term contract.

It was left to the irrepressible Sir Edward Lewis and his Decca Record Company to provide some light relief with a set of figures that showed trading profits up from £3,468,000 to £3,796,000 after a £700,000 contraction in turnover to £24½ million. How this rabbit was pulled out of the hat is not apparent from the preliminary figures, but the report is eagerly awaited for any light it may throw on the question.—*From our City Correspondent.*

Babcock and Wilcox

With their shock announcement that interim dividend is being omitted, the directors have issued an agreeably full explanation. Trading results for the year to date were affected by the low level of manufacturing earlier in the year, by nuclear contracts and by a number of major outstanding claims on contracts still under discussion. In view of this, the directors consider it unwise to draw any conclusion regarding final results for the year. Regarding longer-term prospects, activity has increased and the order book is the highest for four years, but the boiler industry is still suffering from excess capacity. It is also pointed out that provisions already made for nuclear losses are expected to be sufficient. For the past two years both interim and final dividends have been 4½%.

Calcutta Tramways

Traffic receipts increased by £225,000 in 1960, with the accounts reflecting the first full year's benefit from higher fares. While still falling short of what was considered necessary to remove a backlog of maintenance and renewals, this has permitted considerable improvement to permanent way and roads, said the chairman at the annual meeting. Operating expenses were higher and the balance available to shareholders was still below the maximum allowed by agreement with the Government, and would continue to be so for several years.

Decca Record

Higher margins, what a change from the general scene! Despite a £700,000 contraction in turnover (exports to North America fell by £900,000) trading profit increased from £3,468,000 to £3,796,000 in the year to March, preliminary results show. As a result of higher tax and depreciation, net profit is down from £1,260,000 to £1,249,000, but dividend stays at 23¼%.

Ever Ready Trust

The half-year to 30 Sept. has been a good one and interim dividend is raised to 6% from an equivalent of 5-1/3% previously. After deducting all expenses, but before taxation, profit is £91,063 compared with £79,210 in the corresponding period last year.

Fescol

Inquiries for future contracts, although not so numerous as this time a year ago, are still encouraging for the near future. The chairman of this firm, which specialises in electrodeposition of metals, states this in his half-yearly report. Each of the plants has been able to maintain high output in the first half and results for the year should again be satisfactory. Interim dividend is 5% on capital increased by a one-for-two scrip issue.

Racal Electronics

Flotation on London Stock Exchange of this Bracknell New Town company's shares is being arranged by Philip Hill Higginson Erlangers and is expected to take place early next month. Racal (Australia) Pty. has recently been formed to market the firm's radio communications equipment in that area.

W. H. Sanders (Electronics)

The possibility of a rights issue is not ruled out by the chairman, who states that the question of additional finance is being actively considered. Overdraft at 30 June was nearly £129,000, while net current assets were £258,630. The full report shows that the slight decline in profit was due mainly to development expenditure and delays in producing certain units, though shortage of skilled personnel and some narrowing of profit margins were also factors.

Solartron Electronic Group

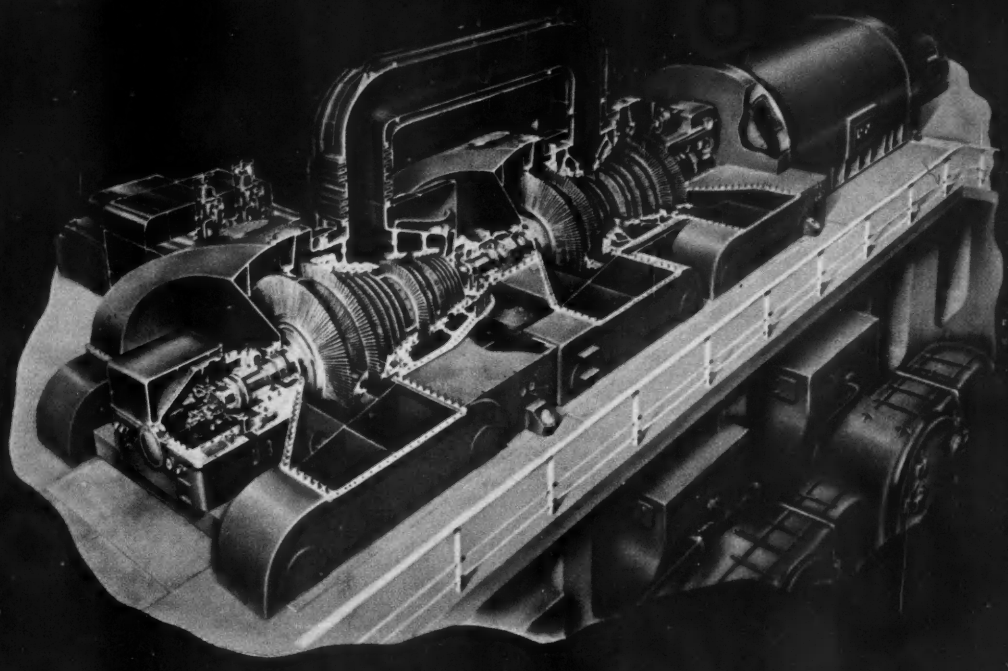
A Press airing of stock market rumours that this group is about to be sold to overseas interests has set the pencils whirring in the Firth Cleveland boardroom. The directors of Firth Cleveland, which acquired a 53% interest in fast-growing Solartron two years ago, are preparing an official statement. Prior to its issue, the company refused to indicate whether it was a confirmation or denial, but a director of Solartron, Mr John Crosse, was reported in the *Daily Express* as saying: "We have heard these rumours, but we are not in a position to make an official statement. If it was an idle rumour we would knock it on the head. At this point of time we can only say we have no comment to make." So it looks as if there is something in it, and one's mind immediately turns to the U.S.

Dividend Announced

Glenfield and Kennedy. Interim 5%.

BEHIND THE MACHINE...

AEI TURBINE EXPERIENCE



NUCLEAR POWER PLANT TURBINES

The ideal design of a turbine for use in nuclear power differs considerably from that in a conventional station. In the latter the trend is towards larger and larger individual units operating at steam conditions, rising, in the case of one unit being built by AEI, to 3500 psig (supercritical pressure) and 1100°F.

In a nuclear plant, despite progressive attainment of increased coolant temperatures, the nature of the reactor places a restriction on steam temperature and turbines must be designed to handle greater quantities of steam at lower conditions.

Such turbines must be larger than similarly rated conventional machines and the provision of an adequate exhaust area is a problem. It is overcome in AEI machines by the use of their well-known multi-exhaust system.

An AEI turbine-generator built for Berkeley Nuclear Power Station. This unit is an 83 MW, 3000 r.p.m. 2-cylinder mixed pressure turbine. H.P. steam at 310 p.s.i.a. and 604 deg. F. is expanded through six stages and is then mixed with L.P. steam at 64 p.s.i.a. and 596 deg. F.

For further information, contact your nearest AEI office or write direct to AEI Turbine-Generator Division

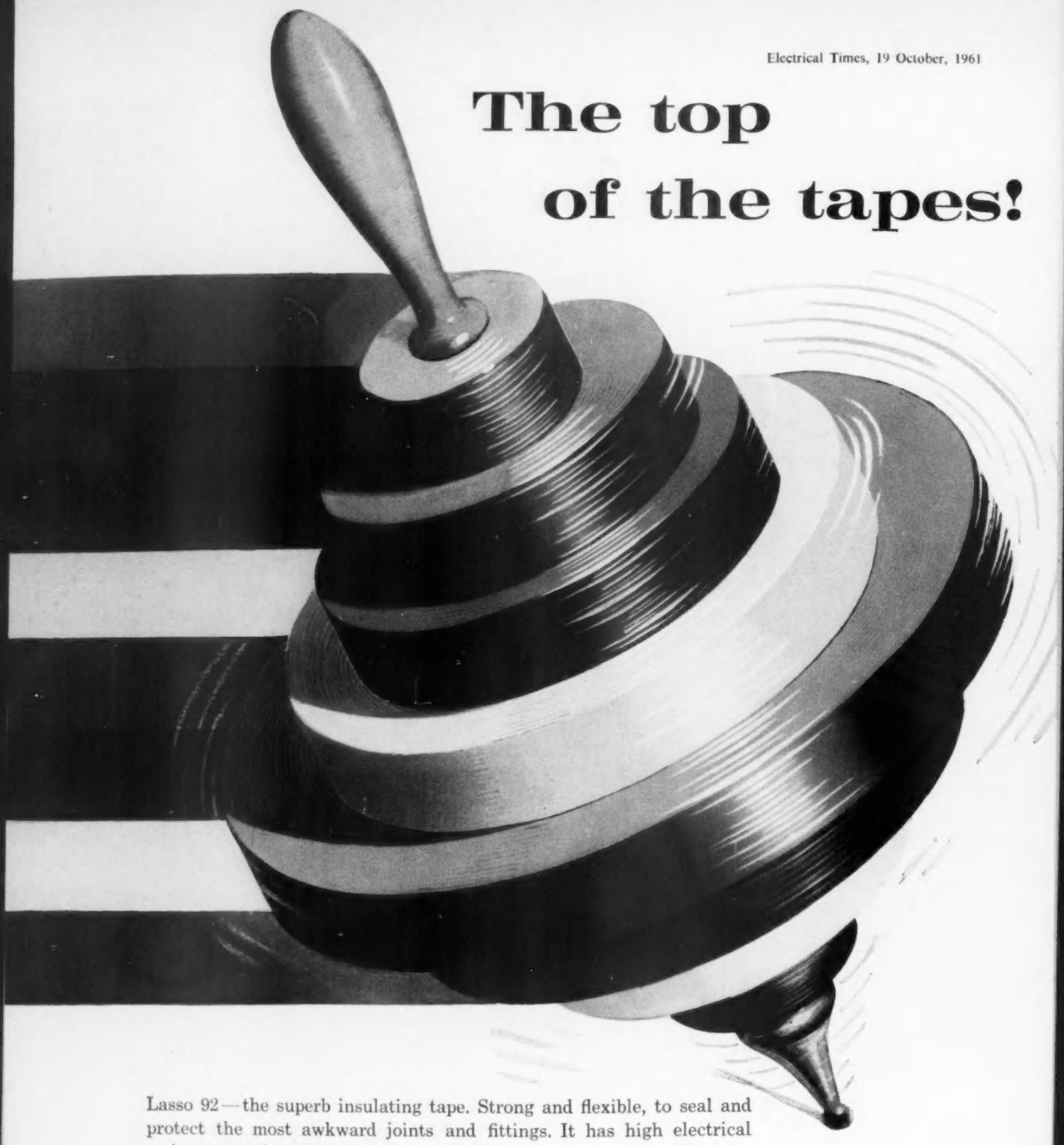
AEI Associated Electrical Industries Ltd.

Turbine-Generator Division

TRAFFORD PARK, MANCHESTER 17 · WORKS AT: MANCHESTER · RUGBY · GLASGOW · LARNE

B/L 103

The top of the tapes!



Lasso 92—the superb insulating tape. Strong and flexible, to seal and protect the most awkward joints and fittings. It has high electrical resistance under all circumstances. Quick and easy to apply. Ideal insulator of high voltage equipment in damp, oily and alkaline conditions.

A few of its many uses

- Joining electrical cables
- Transformer assembly
- Colour identification
- Stopping-off in electro-plating
- Insulating handles of electrical tools
- Sealing apertures against oil, water, acids, dust, etc.

LASSO 92 PVC

ELECTRICAL TAPE

LASSO 92 for Insulation-Identification-Protection

For full information, write to address below, or phone Welwyn Garden 25151

SMITH & NEPHEW LIMITED WELWYN GARDEN CITY HERTFORDSHIRE

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

19 Oct.—Holmfirth U.D.C. Erection of 67 25 ft concrete street lighting columns and supply and fixing of m.v. lanterns/gear. Surveyor, Market St.

20 Oct.—Aberdare U.D.C. Supply and installation of 13 columns/lanterns on Maesgwyn Rd, Cwmdare.—Advertised 28 Sept. issue.

20 Oct.—Chelmsford B.C. Erection, on fixed-price basis, of 50 25 ft steel columns and fixing of 21 fluorescent and 36 140 W sodium lanterns together with ancillary works.—See 12 Oct. issue.

20 Oct.—Edinburgh C.C. Electrical installation, River Purification Offices.—See 5 Oct. issue.

20 Oct.—Montgomeryshire E.A. Electrical installations in schools, canteen and houses at (a) Clatter; (b) Carno; and (c) Rhiwhiriaeth.—See 12 Oct. issue.

20 Oct.—S.E. Metropolitan Hospitals. Applications invited for inclusion in select list for £18,000 electrical installation in Lewisham Hospital extensions.—See 12 Oct. issue.

21 Oct.—Mayo C.C. Supply of electrically operated woodworking equipment: 1, 9 in. surface planer with attachments; 2, 16 in. circular saw benches with attachments; 3, 4 in. chisel mortisers; 4, 14 in. bandsaws; and 5, 3 x 4 in. belt sanders. County Engineer, Courthouse, Castlebar.

21 Oct.—Wellington R.D.C. Class "A" lighting, A5 trunk road. Erection of 40 200 W sodium lamps on 30 ft columns, complete with lanterns/gear. A. E. Philips, Clerk, Council Chambers, Tan Bank, Wellington.

23 Oct.—Ashford U.D.C. Provision and erection of 28 25 ft lighting columns and ancillary works. Surveyor, 1 Elwick Rd, Ashford.

23 Oct.—Down C.C. Electrical heating and lighting installation in Child Health Clinic and Library at Castlewellan.—See 5 Oct. issue.

23 Oct.—Dunbarton C.C. Partial cabling, erection and wiring only of fluorescent street and footpath lights, Cumbernauld New Town. Total of 761 points. W. Arthur, County Lighting Superintendent, 24 George Sq, Glasgow C.2.

23 Oct.—Inverkeithing B.C. Electrical work in 58 houses, Roman Rd.—See 12 Oct. issue.

23 Oct.—Kirkby-in-Ashfield U.D.C. Supply and erection of 22 140 W sodium Class "A" lighting columns, complete with fittings. Surveyor, Council Offices, Kirkby-in-Ashfield.

23 Oct.—Rawtenstall B.C. Supply of (a) 155 140 W sodium lighting units and (b) 155 bracket arms for use with existing steel poles.—See 12 Oct. issue.

24 Oct.—Neath R.D.C. Supply and erection of 52 steel columns, 19 wood pole brackets and one wall bracket, and 72 200 W sodium lamps/gear/wiring.—See 12 Oct. issue.

25 Oct.—Maidstone B.C. Installation of water heaters in ten houses and water heaters/rewiring in 36 flats. Housing Manager, 13 Tonbridge Rd.

25 Oct.—Manchester C.C. Electrical installation in new abattoir, Philips Pk.—Advertised 28 Sept. issue.

26 Oct.—Killeen. Electrical installation, new Customs and Excise Post, Killeen, Co. Armagh. Preference given to firms on King's National Roll. Documents, Room 103, Law Courts Building, Belfast 1.

26 Oct.—Lancs C.C. Rewiring of Haslingden County Secondary School. Applications to County Architect's Dept., P.O. Box 26, County Hall, Preston.

27 Oct.—Belfast C.C. Specification W.200. Supply of 33/11 kV 7·5 MVA step-down transformers.—Advertised 28 Sept. issue.

27 Oct.—Cork. Electrical installations, new Opera House. Documents from J. Varming and S. Mulcahy, 10 South Mall, Cork. Deposit £25 5s.

27 Oct.—Edinburgh Northern Hospitals. (2) Electrical work in X-ray and out-patients' depts. Applications to consulting engineers: Hulley and Kirkwood, 5 Lynedoch St, Glasgow C.3, by above date.

27 Oct.—Howden R.D.C. Contract 2, Supply of 160, 200, 260 and 375 g.p.m. duplicate sewage and one 100 g.p.m. sludge pump complete with motors/starters/accessories for Bubwith and Foggathorpe Scheme.—See 12 Oct. issue.

27 Oct.—Larne B.C. Electrical installation in Agnew St public conveniences. Town Clerk, Gardenmore Hse.

28 Oct.—Bristol C.C. Supply of: lamps, transformers/capacitors, sundries, cables, etc., for year to 31 Dec., 1962. City Engineer and Planning Officer, Cabot Hse, Deanery Rd.—Advertised in this issue.

28 Oct.—Taunton B.C. Supply of electrical goods for one year. Town Clerk, Municipal Buildings.

30 Oct.—Chesterfield B.C. Supply of: (1) 165 25 ft tubular steel columns and three wall brackets; (2) 157 140 W sodium lanterns and one post-top 140 W sodium lantern; (3) 17 3 x 80 W fluorescent lanterns/lamps/gear, alternatively 17 400 W colour-corrected mercury lanterns/lamps/gear; (4) 158 140 W sodium lamps/gear; (5) erection of columns/brackets and removal of 146 concrete 25 ft colunms.—Advertised 12 Oct. issue.

30 Oct.—Newtownabbey. (3) Electrical engineering services in new school buildings, etc., for Board of Governors of Belfast High School.—See 12 Oct. issue.

30 Oct.—Worsley U.D.C. Supply and installation, on fixed-price basis, of 1,000 g.p.m. at 23 ft head, sewage pumps, etc.—See 12 Oct. issue.

31 Oct.—Fermanagh C.C. (c) Electrical work in old people's home.—See 12 Oct. issue.

31 Oct.—Taunton B.C. Provision and installation of 83 electric sink water heaters, Lambrooke, Lyngford and Wedlands estates. H. G. Fox, Housing Maintenance Superintendent, Lambrook Fm Depot, Priory Ave.

1 Nov.—Allestree P.C. Supply and erection of 34 concrete columns and 17 steel brackets on existing trolley poles complete with 140 W sodium lanterns. Clerk, 36 Bridge St, Belper, Derbys. Deposit £2.—Advertised in this issue.

1 Nov.—Bournemouth C.B.C. Supply of: (a) electrical industrial truck and charger; (b) electrical street cleaning truck and charger.—See 28 Sept. issue.

1 Nov.—Coleraine. Heating installation in Camus-Juxta-Bann Church, Macosquin.—See 12 Oct. issue.

1 Nov.—Dartford B.C. Supply and erection of 75 25 ft concrete columns and 400 W MBF/U lamps/lamps, together with removal of existing installations along Town Centre approach roads.—See 12 Oct. issue.

3 Nov.—Bognor Regis U.D.C. Supply and erection of Group "A" and "B" lighting, on fixed-price basis, comprising 196 "Stanton" columns and "G.E.C." lanterns, together with the removal of redundant installations.—See 12 Oct. issue.

3 Nov.—Matlock U.D.C. Provision and erection of 28 Group "A" 140 W sodium lighting on steel columns.—Advertised 12 Oct. issue.

3 Nov.—Notts C.C. Provision and erection of illuminated motorway type traffic signs along six miles A1.—See 12 Oct. issue.

6 Nov.—Clowne P.C. Supply of (1) 115 25 ft tubular steel columns/brackets; (2) 115 140 W sodium Group "A" lanterns; (3) 115 140 W sodium lamps. Erection of columns.—Advertised 28 Sept. issue.

6 Nov.—Durham C.C. Supply and delivery of ten electrically operated diesel delivery pumps. Further particulars, County Surveyor, Aykley Heads, Durham.

6 Nov.—East Riding C.C. Installation of electrical services at proposed Norton County Secondary School and proposed Norton home for aged persons. County Architect, County Hall, Beverley.

6 Nov.—Fylde Water Board. Supply and installation of electrically driven sludge stirring mechanism, 30 ft dia, for Stoks Filtration Plant. Slaidburn, Yorks. Details, Engineer, Fylde Water Board, Sefton St, Blackpool.

6 Nov.—Newtownabbey U.D.C. 250 Group "B" fluorescent lanterns/lamps/control gear/concrete columns.—See 5 Oct. issue.

8 Nov.—Sedbergh R.D.C. Erection of master aerial for TV system, provision of amplifiers and installation of distribution cable to 220 council houses. D. Waring, Clerk, Council Offices, Sedbergh. Deposit £2.

8 Nov.—Yorkshire E.B. Supply of distribution transformers.—See 12 Oct. issue.

12 Nov.—Sunderland C.B.C. £45,000 electrical installation in Technical College, South Johnson St. Borough Architect, Grange Hse, Stockton Rd. Deposit £2 2s.—Advertised in this issue.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 106 queries answered this week

"Leland" motors—address for spares? W.H.P.—Batwin Electric Motors Ltd., 331 Sandycombe Rd, Richmond, Surrey.

Heat pumps—makers of? G.W.—Denco Miller Ltd., Holmer Rd, Hereford; Heat Pump and Refrigeration Ltd., Lansdowne La, Charlton, S.E.7; C.S.A. Industries Ltd., Wharf Rd, Warwick; Jonmil Building Developments Ltd., 16 Carlisle St, W.1; Joseph Lucas Ltd., Gt. King St, Birmingham 19.

"Cobra" lighting fittings—makers of? W.H.P.—Osborn Manufacturing Co. Ltd., 5-13 Highgate Sq, Birmingham 12.

"Mill-Tric" coffee grinder—makers of? E.E.I.—Sew-Tric Ltd., Honeypot La, Stanmore, Middx.

"Lectross" towel and clothes airer—address for spare elements? S.E.B.—Electronic Precision Equipment Ltd., 46 Windmill Hill, Ruislip, Middx.

"Eldur" instantaneous water heater—agents for? B.B.—European Imports and Exports, Rear of 4 Manor St, Bridlington, Yorks.

Marnat Manufacturing Ltd.—address for? M.M.—Now trading as: Warmalec Ltd., 27 Hart St, Walsall, Staffs.

Domestic hood type hairdryers—makers of? E.A.P.—Magicook Appliances Ltd., 115-119 Carlton Vale, N.W.6; Mitcham Manufacturing Co. Ltd., Mitcham Wks, Winchelsea Rd, N.W.10.

20 Nov.—E.B. for N. Ireland. Specification N.I.1719. Supply and commissioning of 110 kV, 33 kV and lower voltage cables/accessories for Rosebank substation—Belfast East Power Station interconnection.—See 12 Oct. issue.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.*

24 Oct.—Pakistan. Supply of 20 petrol-diesel generating sets giving output of 30/40 V; two petrol-diesel generating sets giving 75 V output; three 1 kW, 1·25 kVA at 0·8 power factor diesel generator sets complete with auxiliary equipment. Director-General of Supply and Development, Frere Rd, Karachi. (ESB/31694/61.)*

27 Oct.—Argentina. Supply of 10,000 electricity consumption meters, a.c., single-phase and three-phase. La Direccion Provincial de la Energia-Primera Junta 2558, 2° piso, Santa Fem Provincia de Santa Fe. (ESB/31249/61.)*

28 Oct.—Pakistan. Supply of 11 kV o.c.b's with c.t's. Details from R. E. B. Willcox and Co., 36 Gt. St. Helens, E.C.3. (ESB/31696/61.)*

28 Oct.—Turkey. Supply to State Hydraulic Wks of one generator, nominal power, 1·725 MVA; one power transformer, 1·725 MVA; and 15 kW switches and equipment. Devlet Su Isleri Umum Mudurlugu, Barajlar Ve Hidroelektrik Santraller Dairesi, Reisligi, Bestekar Sokak 25, Ankara. (ESB/31660/61.)*

30 Oct.—Pakistan. L.T. fixed draw-out type o.c.b's with c.t's. Details from R. E. B. Willcox and Co., 36 Gt. St. Helens, E.C.3.

31 Oct.—Canada. 14, 69 kV, single throw, end break operated by disconnecting switches; 14, 7·5 kV, vertical mounting, double-blade, tandem throw, manually operated with spares for above switches. Chairman, Committee of Utilities and Personnel, c/o General Purchasing Agent, 185 King St, Winnipeg 2, Manitoba. (ESB/31919/61.)*

1 Nov.—Nigeria. Supply of: (i) approx. nine miles 33 kV transmission line; (ii) two transforming substations 66/11 kV and 33/11 kV, respectively; (iii) four distribution networks, 11 kV and 400/230 V, distributing power to specified premises. Secretary, Electricity Corpn. of Nigeria, Headquarters, Private Mail Bag 2030, 13 Broad St, Lagos. Deposit £25. (ESB/31396/61.)*

6 Nov.—S. Africa. Generating plant. Diesel engined self-regulating generating sets suitable for mounting on trailers. One 3·5 kVA; five 6 kVA; and two 10 kVA. Secretary, State Tender Board, 291 Bosman St, P.O. Box 371, Pretoria.

25 Nov.—India. 12 diesel generating sets rated between 375 and 400 kVA, with switchboard. National Coal Development Corp. Ltd., Chief Purchase Officer, Darbhanga Hse, Ranchi. (ESB/31902/61.)*

14 Dec.—India. Tender Inquiry C/23330/61/E.P. One travelling ore handling grab crane for Madras Port Trust. India Store Dept., Government Bldg, Bromyard Ave, W.3, viewing reference S.3450/61/NSC/ENG.2.

29 Dec.—Portuguese E. Africa. Supply of electrical equipment for power distribution network on wharves 6 and 7, Port of Beira. Ports, Railways and Transport Dept., Lourenco, Marques. (ESB/31917/61.)*

30 Jan.—Australia. 2,200-ton conveyor belt systems for Morwell brown coal—Hazelwood power station. Details from Agent-General for Victoria, Victoria Hse, Melbourne Pl, Strand, W.C.2.

28 March—Argentina. 335,666,400 peso extension for Sorrento thermal station and Rosario Norte transformer station for Argentine Water and Electric Power Board. La Sub-Gerencia Talleres y Suministros Lavalle 1527, piso 2, Buenos Aires. B.o.T. (ESB/30714/61).*

TRADE NOTES

Australian Tariffs. The Australian Tariff Board is considering whether assistance should be given to the production of static condensers for p.f. correction, of 1 KVAr or higher.

BEAMA Contract Price Adjustment Formulae. *For Electrical Machinery and Equipment.* For purposes of calculating variations in: *(a)* "Rates of Pay"—the rate of pay for adult male labour at 13 Oct., 1961, shall be deemed to be 213s 6d; *(b)* "Cost of Material"—the index figure for materials used in the Electrical Machinery industry at 13 Oct., 1961, is 119·0* (184·6*).

For turbo-generating and Allied Plant. For purposes of calculating variations in: *(a)* "Rates of Pay"—the rate of pay for adult male labour as at 13 Oct., 1961, shall be deemed to be 213s 6d; *(b)* "Cost of Materials"—the index figure for materials used in the Mechanical Engineering Industry at 13 Oct., 1961, is 128·8* (193·5*). "Blast Furnace and Iron and Steel Melting and Rolling (1948 S.I.C. ref. 40/41)" 191·5. Other Steel Goods excluding tubes (1958 S.I.C. ref. 311/2), 130·5*. The price of brass condenser tubes ¾ in. o/d 18 s.w.g. on 13 Oct., 1961, is 4s 1¼d per lb. *Provisional figure.

The figures in parentheses shown above relate to earliest list of wholesale price index numbers in which the year 1949 is taken as the base 100. For the other figures 1954=100.

Changes of address. Salamandre Metal Works Ltd. have this week moved their stores to 93 Bayham St, Camden Town, N.W.1.

Horsburgh and Francis Ltd., electrical wholesalers, have moved into new premises in Gooch St, Birmingham. The Sales Dept. of R. and A. Main Ltd. (Electrical Division) has been transferred to the company's Gothic Works, Edmonton, N.18. Telephone: Edmonton 3030.

Expansion. The Rawlplug Co. have purchased the freehold premises at Brent Wks, Colindale Ave, N.W.9, formerly the property of the Tilley Lamp Co.

E.W.F. Conduit Distributors Ltd., Leeke St Corner, King's Cross Rd, W.C.1, have been elected a member of the Electrical Wholesalers' Federation.

New factory. Marbon Chemical Division of the Borg-Warner Corporation of Washington, West Virginia, and the Anchor Chemical Co. Ltd., of Manchester, announce the purchase of a site at Grangemouth, Scotland, for the construction of a plant to produce Marbon's brand polymers and other synthetic resins. Anchor Chemical Co. are sole distributors for Marbon in the U.K. and elsewhere in the world.

CONTRACTS PLACED

Admiralty. Lighting and power installation in Carmarthenshire, Campbell and Isherwood Ltd.; cable distribution and street lighting installation in Fife, James Kilpatrick and Son Ltd.

Gateshead B.C. Electrical installation, Gateshead Boys' Grammar School, Campbell and Isherwood Ltd., Newcastle, £12,438.

L.C.C. Supply, installation and maintenance of three lifts, Northampton College of Advanced Technology. Finsbury, Express Lift Co. Ltd., Northampton, £28,702.

Middlesbrough B.C. Electrical installations, new community centres, Berwick Hills and Whinney Banks. Doves (Darlington) Ltd. Total value, £3,427.

Repton R.D.C. Supply and erection of 41 steel and concrete columns at Willington, Abacus Municipal Ltd.

St. Pancras B.C. Electrical installations in block "B," Ferdinand St Housing Scheme, Thos. H. Smerdon Ltd., £4,578; and installation of two lifts in same block, Express Lift Co. Ltd., £5,444.

Scunthorpe B.C. Electrical installations in building scheme 94, Hobson and Scott Ltd., Chippinghouse Rd, Sheffield, £2,259.

Stoke-on-Trent C.C. Electrical installation at extensions to junior training centre, Fenton, Speed Electric Service Ltd., Hill Church St, Hanley, £3,783; electrical installations, Hanley Pk, Barnett and Soames Ltd., South Wolfe St, Stoke, £1,243. Recommended.

Sunderland B.C. Electrical installation, 209 new houses, Town End Farm estate, J. Calvert Ltd., Seaham.

Gazette Announcements

COMPANIES ACTS

Trinity Trading Co. Ltd. Creditors to send details to liquidator: J. Auerbach, 9 Mansfield St, W.1, by 25 Oct.

Pool Electrics (Blackpool) Ltd. Meetings of members and creditors to be held at Bank Chmbrs, 7 South King St, Blackpool, on 31 Oct., at 2.30 and 3 p.m., to receive an account of the winding-up.

Electric House (F.G.H.) Ltd. Meeting of creditors to be held at Houldsworth Hall, 90 Deansgate, Manchester 3, on 19 Oct., at 12 noon.

Reelek Appliances Ltd. Petition for winding-up to be heard at Royal Courts of Justice on 23 Oct. Persons intending to appear to notify Crossman, Black and Keith, 16 Theobalds Rd, W.C.1, by 20 Oct.

Lowelectrix Ltd. Petition for winding-up to be heard at Birmingham County Court on 14 Nov. Persons intending to appear to notify Claude M. Payne and Co., 12 Manor Rd, Coventry, by 13 Nov.

BANKRUPTCY ACTS

Public Examination

Bury St. Edmunds. J. W. Carrington and R. A. Fenn, electrical contractors and retailers, carrying on business in partnership at 25a Angel Hill. Public examination: 11 a.m., 17 Nov., at Shire Hall, Bury St. Edmunds.

Receiving Order

Bradford. E. M. Perrett, furniture and domestic electrical retailer, 8 West La, Thornton. Receiving order dated 5 Oct.

Appointment of Trustee

Preston. E. Middleton, trading as Home Electrics at 83 Friargate, Preston. Trustee: R. A. Hawken, Bank Chmbrs, 1 John St, W.C.1, appointed as from 5 Oct.

Intended Dividend

Birmingham. J. Vipond, electrical contractor, formerly of 6 Taunton Rd, Sparkbrook. Last day for receiving proofs: 28 Oct. Trustee: W. L. Hand, Colmore Hse, 21 Waterloo St, Birmingham.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Adup. 822,329. Class 9. Connectors for wires and cables, etc. Jackson Brothers (London) Ltd., Kingsway, Waddon, Surrey.

Radyne in design. 812,937. Class 7. Machines for welding sheets of plastics, etc. Radio Heaters Ltd., 42 Bedford Ave, W.C.1.

Telcalloy. 815,550. Class 6. Alloys and wires, etc. Telcon Metals Ltd., Manor Royal, Crawley, Sussex.

Unipol. B795,075. Class 9. Domestic polishing machines, etc. Manz and Pfeiffer, 17-25 Griegstrasse, Stuttgart-Botnang, Germany.

BUSINESS PROSPECTS

Ampthill. Proposed: factory, Station Rd, for Interlas Ltd., 9 Church St.

Barnstaple. Proposed: motel, restaurant and ballroom, Saunton Rd, Braunton, for R. Harris and Son (Braunton Builders) Ltd., East St, Braunton.

Bath. Gerrard, Taylor and Ptnrs., 4 Bridge St, architects for rebuilding of Royal National Hospital for Rheumatic Diseases, for S.W. Regional Hospital Board.

Berwick. B.C. propose 42 houses, West Field estate, and further 50 dwellings in slum areas; Engineer.

Billingham. Chapman Taylor and Ptnrs, Grand Bldgs, Trafalgar Sq, W.C.2, architects for proposed supermarket, The Causeway. U.D.C. accept tender of Moore and Cartwright Ltd., High St, Norton-on-Tees, for 43 houses, Low Grange estate.

Bradford. Bradford and Leeds Joint Airport Committee propose development of terminal area and buildings at Airport.

Builth Wells. Factory proposed by Webb, Corbett Ltd., Coalbourn Hill Glass Wks, Stourbridge, Worcs.

Cardiff. Factory to cost £350,000 proposed by Corona Soft Drinks Ltd., Fforestfach; architects: Powell and Allport, 88 Cathedral Rd. Offices to cost £327,000 proposed at Bute Terr for Wales Gas Board, Windsor Pl; architects: T. Alwyn Lloyd and Gordon, 6 Cathedral Rd.

Chelmsford. Proposed: shop/showrooms/store, High St, for Ten Counties (Chelmsford) Ltd.; architects: Carl Fisher and Assoc., 56 Portland Pl, W.1. Extensions to technical offices, Arcworks, Writtle Rd, for Crompton Parkinson Ltd.; architects: Adie, Button and Ptnrs., 7 Carlos Pl, W.1.

Chester C.C. Tender: extensions to Cheadle County Grammar School for Girls; County Architect, Chester.

Chesterfield. B.C. propose first stage development, Loundsley Green estate, with 800 dwellings and shops; Surveyor. New Square Properties Ltd. propose £90,000 four-storey shops/offices.

Chester-le-Street. Proposed by D. Crouch Ltd., Station Rd, Birtley, housing estate, Prebends Row, West Pelton.

Colne B.C. Tender: 94 dwellings, Lob Common; Engineer.

Coventry. Proposed by Coventry Climax Engines Ltd., Godiva Wks, Widdrington Rd, factory, offices, etc., Stonebridge Highway. Barclays Bank Ltd., Lombard St, E.C.3, propose premises at Corporation St.

Cumbernauld. Tenders obtained shortly for extensions to cover 100,000 sq ft for Burroughs Adding Machines Ltd., 8 Lowther Terr, Glasgow W.2.

Dagenham. Proposed: supermarket, offices and store at Heathway, for Covered Markets Ltd.

Dumbarton. The British Oxygen Co. Ltd., Spencer Hse, St. James's Pl, S.W.1, propose light engineering factory.

Durham. R. Coleman Ltd., High St, Carrville, propose 38 houses, The Sands.

Eastbourne. Proposed by Auto Productions Ltd., Holmesdale Wks, High Rd, Sevenoaks, Brampton Rd factory, 8,000 sq ft, with two-storey office block.

Edinburgh. Proposed: theatre on site of Synod Hall, Usher Hall, Lyceum Theatre; cost £1 million: architects: Roward Anderson, Kininmouth and Paul, 16 Rutland Sq.

Essex C.C. Proposed: by Denbrick Investments Ltd. 25-storey point block of 75 flats, Hall La, Walton-on-the-Naze.

Flint B.C. Tender: 40 traditional dwellings, Duke St; Engineer.

Gateshead. Proposed: shopping centre of 50 shops, Ellison St and High St, by E. Alec Colman Group: architect: H. O. Ludor, 79 Regency St, S.W.1.

Gillingham. Factory to cost £100,000 planned for Betabake (Kent) Ltd., 70 High St, Strood: architects: H. A. Halpern and Assoc., 58 Cannon St, E.C.4.

Glasgow. Planned: seven-storey office block, junction of Waterloo and Douglas Streets, for Argyle Securities Ltd., 24 Manor Pl, Edinburgh 3; cost: £200,000.

Grantham. Proposed: development of Watergate, by L. H. Fewster and Ptnrs., architects, 22 Conduit St, W.1; promoters: City and Town Buildings Ltd.

Hebburn. U.D.C. propose shopping centre, Station Rd; architects: Cackett, Burns, Dick and Mackellar, 21 Ellisdon Pl, Newcastle.

Heston and Isleworth. Allnatt (London) Ltd., 23 Park Royal Rd, N.W.10, propose to develop land at Green La, Hounslow, for industrial purposes.

Holland C.C. Tender: Sutton Bridge County Primary School; Clerk, County Hall, Boston.

Huddersfield C.B.C. Tender: 30 dwellings, Heathfield, Crosland Moor; Architect.

Inverness. Falkirk Dev. Co. Ltd. and E. Alec Colman Group, 5 Hyde Park Gate, S.W.7, plans redevelopment of properties on Bridge St, Bank St, Church St; architects: Covell and Matthews, 34 Sackville St, W.1.

Leamington Spa. Planned: factory/office block, Queensway trading estate, for Expendable Products Ltd., of that address. Factory/offices/store, Althorpe St, Neilston St junction, for Sotowear (Coventry) Ltd., 1 Bedford St, Leamington Spa. Factory at Queensway trading estate, for J.A.Y. Reproductions Ltd.

Leeds. Proposed: brewhouse, malt silo block and store, South Brook St, for J. Tetley and Son Ltd.; contractors: R. H. Thompson Ltd., Lady La, Leeds 2.

Leicester. Proposed at junction of Northampton and St. George Streets by Grosvenor House Hotels (Park Lane) Ltd., Park La, W.1, 210-bedroom hotel with ten shops, 20-storey office block and underground garage: architects: R. D. Russell and Ptnrs., 28 Little Russell St, W.C.1; cost: £2¼ million.

Liverpool. Planned at Kirkby by Walker Cain Ltd., Liverpool, residential hotel and licensed premises.

London. S.E. Met. Regional Hospital Board, Eastbourne Terr, W.2, placed a £74,285 contract with Prestige and Co. Ltd., 149 Grosvenor Rd, S.W.1, for nurses' training school, recreation hall and clinic at St. Giles Hospital. C.C.: Lyons, Israel and Ellis, architects, 43 Portland Pl, W.1, for a home for old people, Dorinda St, Islington, N., to cost £178,060. Marchmont Properties, 5 Hyde Park Gate, S.W.7, plan redevelopment of ten acres at Bloomsbury, shops, offices and residential property are planned. Proposed: shops/showrooms/offices, Euston Rd area, by Lewis Solomon, Kaye and Ptnrs., architects, Thavies Inn Hse, Holborn Circus, E.C.1. Planned: three- and nine-storey office, south of Cockfosters Stn, also five-storey offices, junction of Cockfosters Rd and Chalk La, by Riches and Blythin, architects, 16 Northumberland Ave, W.C.2.

Longbenton. U.D.C. propose 24 houses, Laurel Ave, Palmerstille; Surveyor, Council Offices, Forest Hall, Newcastle.

Lurgan, N.I. Contract placed for extensions to U.K. Optical Co. Ltd. factory, Lurgan, for Ministry of Commerce; contractors: R. J. Campbell (Belfast) Ltd., Palmerston Rd, Belfast.

Luton. Proposed: factory/offices block, Arundel Rd, for Ketton Ashwell Ltd. Chemical production building, Kingsway, for Lanorte Chemicals Ltd., of that address. Extensions to factory and offices, junction of Duke and Taylor Streets for Barclay Stuart (Plastics) Ltd. Idmiston Properties Ltd., City Wall Hse, Finsbury Pavement, E.C.2, plan 20-storey office block, junction of Waller St and Church St. Shopping development, Marsh La, for Beaumont Securities Ltd., being planned by R. Mountford Pigot and Ptnrs., architects, 3 Cromwell Pl, S.W.7.

Lutterworth. B.C. propose 62 dwellings, Jubilee Rd estate, Broughton Astley; Surveyor.

Manchester. 31-storey office block with shops, restaurant, etc., Major St, proposed by Sidney Hillman (Whitworth St Estates) Manchester. Offices and warehouse proposed, Stock St, Cheetham, by Howe and Brother (Dundee) Ltd., 8 Loom St. C.C. Tender: Northern Area fire station, Blackley; City Architect.

Middlesbrough. B.C. propose 91 old people's houses, several areas; Engineer. Also £231,000 Middle Beck No. 4 Secondary School; Education Architect.

Newcastle. Wm Leech Ltd., St. James St, propose £250,000 flats, Benwell.

Newport. B.C. plan three-storey home at Hendre Farm Dr, Ringland estate, to cost £105,603.

Newport Pagnell. Cooper and Farquhar, 44 Devonshire St, W.1, architects for shops/flats, St. John St, for Central Land Investments Ltd.

N. Ireland. Co. Derry Welfare Committee placed contract with Hugh Taggart Ltd., Ballymoney, for £96,685 old people's home, Moneymore.

North Riding. C.C. propose fire station, Reeth; County Architect, Northallerton.

Northumberland. C.C. award £194,000 contract for Guide Post Secondary School to Gilbert Ash Ltd., London.

Paisley. Development scheme at works proposed by James Anderson and Co. (Colour) Ltd., paint and printing manufacturers, Hawkhead Rd, Paisley; cost: about £1 million.

Port Talbot. Proposed: development of Aberavon seafront as civic centre, with hotel and multi-storey flats; John Morgan Harries, consultant architect, 40 Caroline St, Bridgend.

Richmond (Yorks). R.D.C. propose 40 dwellings, Gilling; Surveyor, Market Pl.

Rotherham. Planned: extensions, etc., Swinden Hse, Moorgate Rd, for United Steel Co. Ltd. Extensions, Sheffield Tube Wks, Alsing Rd, for Howell and Co. Ltd.

Salford. C.C. propose £60,499 purpose-built home for elderly, Bury New Rd.

Scunthorpe. B.C. propose 1,000 dwellings in 1962-3 programme; Surveyor.

Sedgefield. Proposed, 26 houses, Ferryhill, for Turnbull, Son and Parkinson; architects: Fennell and Baddiley, Bridge End Chmbrs, Chester-le-Street.

Sheffield. Contract placed with J. W. Sivid Ltd., 39 Canterbury Ave, for factory and office premises at Allen St, for William Skidmore and Co. Ltd. Covenant Securities Ltd., 130 Mount St, W.1, propose offices, licensed hotel, shops and garages, Church St area.

Shipley. Proposed: development of 17 acres of land at Dockfield industrial estate for Metal Box Co. Ltd., Baker St, W.1; consulting engineers: Husband and Co., 388 Glossop Rd, Sheffield 10.

Southampton. Precinct of 30 shops proposed off St. Mary St, Six Dials La, for Commercial Developments (Southampton) Ltd., High St.

Sunderland. Estates Management Corpn., Team Valley, Gateshead, to build a factory for James A. Jobling and Co. Ltd., Wear Glassworks: architects: Matkin and Hawkins, Barclays Bank Chmbrs, Fawcett St. British Railways, York, propose reconstruction of bomb damaged Sunderland Railway Station.

Thetford. Tenders invited this month for chipboard factory and sawmill for Novobord (U.K.) Ltd.; architects: H. G. Huckle and Ptnrs., 30 Queen St, W.1; cost: £420,000.

Walsall C.B.C. Tender: West Midlands Teachers' Training College and assctd works; approximate value: £600,000; Director of Education, Durwall St.

West Hartlepool. B.C. award G. M. Pearson and Son, Hetton, contract for 73 houses.

MEETINGS TO NOTE

THURSDAY, 19 OCT.

I.E.E. (N. Midlands). "Transport and Electric Traction," G. Streets. Joint meeting with the Graduate and Student Section at the Lecture Theatre, Y.E.B. Offices, Ferensway, Hull. 6.30 p.m.

I.E.E. (Western). "Radiocommunication in the Power Industry," E. H. Cox and R. E. Martin. N. Glos Technical College, Cheltenham. 6 p.m.

CHELMSFORD ENGINEERING SOCIETY. "Developments in Stator-fed Variable Speed a.c. Commutator Motors," J. C. H. Bone. Social Hall, Hoffmanns Mfg. 7.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY. The Thomson Lecture: "The Inspiration of Science," Sir George Thomson. Royal Institution, Albemarle St, W.1. 6 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Grangemouth). "Computers," J. Keay. Leapark Hotel, Bo'ness Rd. 7 p.m.

INSTITUTION OF PLANT ENGINEERS. "The Maintenance Problems in a Nuclear Power Station," J. R. Treharne. Castle Hotel, Blackburn. 7.30 p.m.

A.S.E.E. (Newcastle upon Tyne). "Office Lighting," R. A. Hall. Roadway Hse, Oxford St. 7.30 p.m.

S. WALES INSTITUTE OF ENGINEERS. 103rd a.g.m., presidential address, J. Selwyn Caswell. Institute Buildings, Park Pl, Cardiff. 6 p.m.

FRIDAY, 20 OCT.

I.H.V.E. (Manchester). "Air Conditioning of Operating Theatres," R. Blowers. Engineers' Club, Albert Sq. 6.30 p.m.

BIRMINGHAM ELECTRIC CLUB. Annual dinner. Grosvenor Room, Grand Hotel. 6.30 p.m.

JUNIOR INSTITUTION OF ENGINEERS. "Recent Trends in Telecommunications," R. A. Hill. Pepys Hse, Rochester Row, S.W.1. 7 p.m.

I.E.E. (N.E. Graduates and Students). "An Introduction to Electro-physiology," D. H. Lane. Grey Hall, King's College, Newcastle. 6.30 p.m.

MONDAY, 23 OCT.

I.E.E. Discussion: "Is Automation Making Satisfactory Progress?" Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (E. Anglian). "British Nuclear Power Today," A. L. Shaw. Assembly Hse, Norwich. 7.30 p.m.

I.E.E. (Mersey and N. Wales). "Technical and Economic Aspects of the Supply of Reactive Power in England and Wales," W. Casson and H. J. Sheppard. Town Hall, Chester. 6.30 p.m.

I.E.E. (N.E.). "Silicon Power Rectifiers," A. J. Blundell, A. E. Garside, R. G. Hibberd and I. Williams. Neville Hall, Westgate Rd, Newcastle upon Tyne. 6.15 p.m.

I.E.E. (N. Staffs). "The Development of Communication, Indication and Telemetering Equipment for the British Grid," G. A. Burns, F. Fletcher, C. H. Chambers and P. F. Gunning. N. Staffs College of Technology, Stoke-on-Trent. 7 p.m.

I.E.E. (N.W.). Discussion: "How Long Do We Go On Teaching Our Subject Historically?" Education Discussion Circle meeting at the Royal College of Advanced Technology, Salford. 6.15 p.m.

I.E.E. (S. Midlands Electronics and Measurement Group). "Space-charge-limited Dielectric Devices—Successors to the Transistor?" G. T. Wright. James Watt Memorial Institute, Birmingham. 6 p.m.

I.E.E. (Western Utilisation Group). Section Chairman's address: "Research in the Field of Electricity Utilisation," H. G. Taylor. S.W.E.B. Demonstration Theatre, Bristol. 6 p.m.

I.E.S. (Bath and Bristol Centre). "The New I.E.S. Code," H. Hewitt. Gardiner, Sons and Co. Ltd., Bristol.

I.E.S. (Birmingham Centre). "Floodlighting in Colour," J. W. Bessant. Chamber of Commerce 75 Harborne Rd, Edgbaston, Birmingham 15. 6.30 p.m.

I.E.S. (Leeds Centre). "Office Lighting," R. G. Hopkinson. British Lighting Council, 24 Aire St, Leeds 1. 6.15 p.m.

I.E.S. (Leicester Centre). "The New I.E.S. Code," W. E. Harper. Demonstration Theatre, E. Midlands EB, Charles St, Leicester. 6.15 p.m.

A.S.E.E. (Oxford and Districts). "Servomechanism Components and Their Applications." The Reactor School, AERA, Harwell. 7.30 p.m.

TUESDAY, 24 OCT.

I.E.E. (Measurement and Control). "The Use of Analogue Computers in Predicting the Space-time Behaviour of Nuclear Reactors," R. W. Hockney and T. O. Jeffries. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (N.W. Supply Group). "A General Method of Digital Network Analysis Particularly Suitable for Use with Low-speed Computers," M. N. John. "Digital Computers in Power System Analysis," P. P. Gupta and M. W. Humphrey Davies. Engineers' Club, Manchester. 6.15 p.m.

I.E.E. (S.E. Scotland). Sub-Centre Chairman's address, W. E. J. Farvis. Carlton Hotel, North Bridge, Edinburgh. 7 p.m.

I.H.V.E. (Scottish). Discussion: "The Heating of Buildings by Off-Peak Electricity Supplies." Scottish Bldg Centre, 425 Sauchiehall St, Glasgow. 7 p.m.

I.H.V.E. (Liverpool and District). "Radiant Heating—A Comparison of the Merits of Floor and Ceiling Applications," A. Griffiths and P. S. Harris. Exchange Hotel, Tithebarn St, Liverpool. 6.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Cheltenham). "Instrumentation in Ice Cream Manufacture," E. H. Higham. Belle Vue Hotel. 7.30 p.m.

I.E.S. (Liverpool Centre). "The New I.E.S. Code," H. E. Bellchambers. Industrial Development Centre, Paradise St. 6 p.m.

WEDNESDAY, 25 OCT.

I.E.E. (Electronics and Communications). Chairman's address: "Global Communications," R. J. Halsey. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (N. Lancs). "Submersible Pumping Plant," H. H. Anderson and W. G. Crawford. N.W.E.B. Demonstration Theatre, Duke St, Barrow. 7.30 p.m.

I.E.E. (Rugby). "Electric Ship Propulsion with Special Reference to s.s. *Canberra*," L. W. W. Graham. Joint meeting with Rugby Engineering Society. Rugby College of Engineering Technology. 6.30 p.m.

I.E.E. (Southern). "The Transmission of Speech Through Narrow Bandwidths," L. G. Stead. King's Arms Hotel, Christchurch. 6.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Data Processing Section). "Mechanising Factory Shop Floor Form Filling," W. H. Baker and P. Huggins. Manson Hse, 26 Portland Pl, W.1. 6.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (S. Wales). "Precision Temperature Measurement and Control," H. W. Gosling. University College, Swansea. 6.45 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS. Symposium: "Digital Differential Analysers." London School of Hygiene and Tropical Medicine, Keppel St, W.C.1. 6 p.m.

BATTI-WALLAHS' SOCIETY. Luncheon. Connaught Rooms, Gt. Queen St, W.C.2.

THURSDAY, 26 OCT.

I.E.E. "A Comparison between Generation and Transmission Problems in Great Britain and France," P. M. J. Ailleret. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (S. Midlands). "Some Recent Developments in Electro Heat," E. May. Education Discussion Circle meeting, College of Technology, Gosta Green. 6.15 p.m.

I.E.E. (Southern). "A General Theory of Depreciation of Engineering Plant," D. Rudd. Joint meeting with the Southern branch of the Institution of Mechanical Engineers at the Farnborough Technical College. 6.30 p.m.

I.E.E. (N. Scotland). Sub-Centre Chairman's address, G. L. Doig. Electrical Engineering Dept., Queen's College, Dundee. 7 p.m.

INSTITUTION OF MECHANICAL ENGINEERS. Presidential address, Sir Kenneth Hague. 1 Birdcage Walk, S.W.1. 6 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Chester). "Radiation Pyrometry," T. Land. Stanley Palace, Watergate St. 7 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (W. Midlands). "Instruments for the First U.K. Scout Satellite," J. Sayers. Birmingham University. 6.15 p.m.

A.S.E.E. (East Kent). East and West Kent Branches Joint Annual Dinner. Royal Star Hotel, Maidstone.

A.S.E.E. (South London). "Navigation Lights: Manufacturing and Servicing," A. F. Burn. Greyhound Hotel, Croydon, Surrey. 8 p.m.

A.S.E.E. (Northern Ireland). "The Art and Science of Lighting," W. M. Pierce. Central Hall, Rosemary St, Belfast.

A.S.E.E. (Southampton). "The Practical Application of the New I.E.S. Code," P. G. Merritt. Polygon Hotel, Southampton. 8 p.m.

FRIDAY, 27 OCT.

I.E.E. (E. Midlands) Kettering District dance. George Hotel, Kettering. 9 p.m.

I.E.E. (Southern). "The Psychology of Study," C. A. Mace. South Dorset Technical College, Weymouth. 6.30 p.m.

I.E.E. (Southern). "Safety in the Utilisation of Electricity," S. J. Emerson. S.E.B. Showrooms, Newport, I.o.W. 6.30 p.m.

I.E.E. (N. Scotland). Sub-Centre Chairman's address, G. L. Doig. Robert Gordon's Technical College, Aberdeen. 7.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Scottish). "The Variable Area Flowmeter Sheds its Limitations," N. Nixon. Scottish Building Centre, Sauchiehall St, Glasgow. 7.15 p.m.

A.S.E.E. (Coventry and District). "The Revision of British Standards and their Effect on Motor Applications," F. T. Bartho. The Conservative Rooms, 16 Queens Rd, Coventry. 8 p.m.

A.S.E.E. (Stoke and Crewe). "The Lighting of Offices," D. Whipp. Royal Hotel, Crewe. 7.30 p.m.

MONDAY, 30 OCT.

INSTITUTION OF MECHANICAL ENGINEERS (Thermodynamics and Fluid Mechanics Gp). Discussion: "The Extent to Which Data Can be Made Available for Engineering Design." 1 Birdcage Walk, Westminster, S.W.1. 6 p.m.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

Beryllium and Copper Alloys (Moulds and Dies) Ltd., 47 Victoria St, S.W.1. Nom. cap.: £1,000. Dirs.: Bernard R. Symonds, George H. Symonds, Hugh T. L. Symonds, Douglas Symonds and Wm. H. St. George.

Couper Electrical Sales Ltd., 12 Whitehall, S.W.1. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: A. Kane and J. G. Barnes.

Edan Electronic Trading and Manufacturing Co. Ltd., 45 Alfred Rd, W.3. Nom. cap.: £100. Dirs.: Anthony S. Young and Bryan V. Williamson.

Ericson Electrical Co. Ltd., 141 High St, Ruislip. Nom. cap.: £3,000. Dirs.: Eric P. Mendoza and Muriel Mendoza.

Export Supplies (Staines) Ltd., Fairfield Hse, Fairfield Ave, Staines, Middx. Exporters and importers of electrical and mechanical goods and equipment, etc. Nom. cap.: £1,000 Dir.: Richard J. Bolton.

Grimwood Electrical Products Pty. Ltd. British address: Ebury Chmbrs, 74 High St, Rickmansworth, Herts. Registered in New South Wales on 7 May, 1948, to acquire the business then carried on at Sydney as "Grimwood Electrical Products," etc. Capital: £500,000. Name of person authorised to accept service: Wm. Thomas, Ebury Chmbrs, 74 High St, Rickmansworth, Herts.

Oxford Instrument Co. Ltd., 33 Gutter La, E.C.2. Designers, manufacturers of and dealers in electrical apparatus, etc. Nom. cap.: £100. Dirs.: Martin F. Wood and Kathleen A. Wood.

Ronada Ltd., 153 Queens Rd, Blackburn. To carry on business of electricians, etc. Nom. cap.: £2,000. Dirs.: Ronald Rimmer and Miss Ada Caunce.

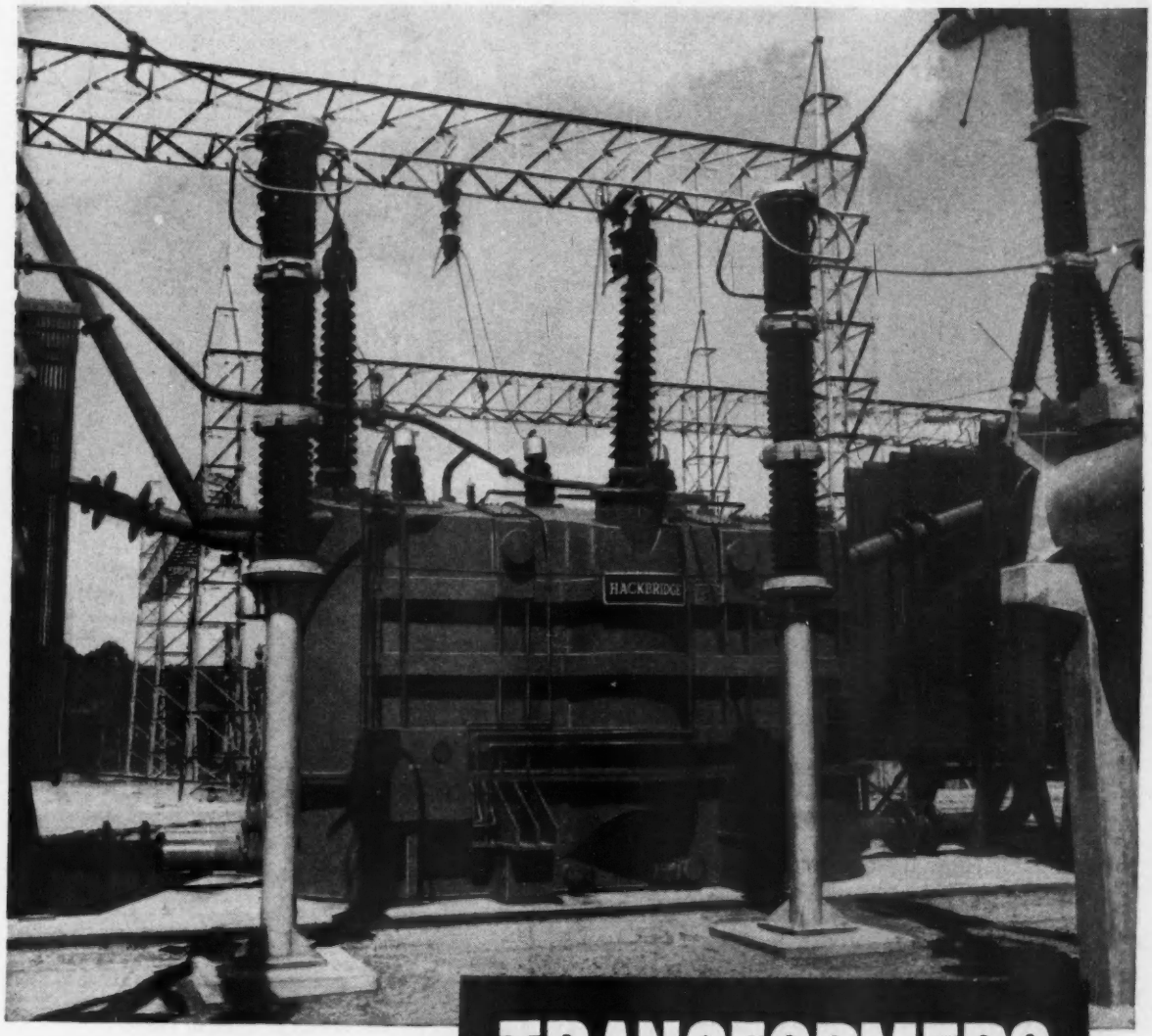
S.E.M. Consultants Ltd., 9 Queen Victoria St, Reading. Structural, electrical and mechanical engineering consultants, etc. Nom. cap.: £1,200. Permanent dirs.: Harold J. Hay, Colin K. Peter, Leslie Moore, Alan J. North and Wm. J. T. Beale.

Peter Smailes Ltd., 2 Bramble Rd, Southsea. To carry on the business of electrical engineers, etc. Nom. cap.: £3,000. Dirs.: Peter C. Smailes and Freda K. Smailes.

E. R. Wilshere Ltd., 19 Pitsford St, Birmingham 18. Manufacturers of and dealers in electrical goods and equipment, etc. Nom. cap.: £100. Dirs.: Edgar R. Wilshere and Margaret F. Wilshere.

L. G. Woollett and Co. Ltd., 222-5 Strand, W.C.2. To carry on business of electricians, etc. Nom. cap.: £500. Dirs.: Leonard G. Woollett, Reginald Day, Charles F. Lockwood and Anthony A. Denny.

W. C. Wynn Ltd., 2 Station Sq, Flitwick. Electrical and radio engineers and contractors, etc. Nom. cap.: £1,500. Dirs.: William C. Wynn, Mrs Muriel E. Wynn and Graham C. Wynn.



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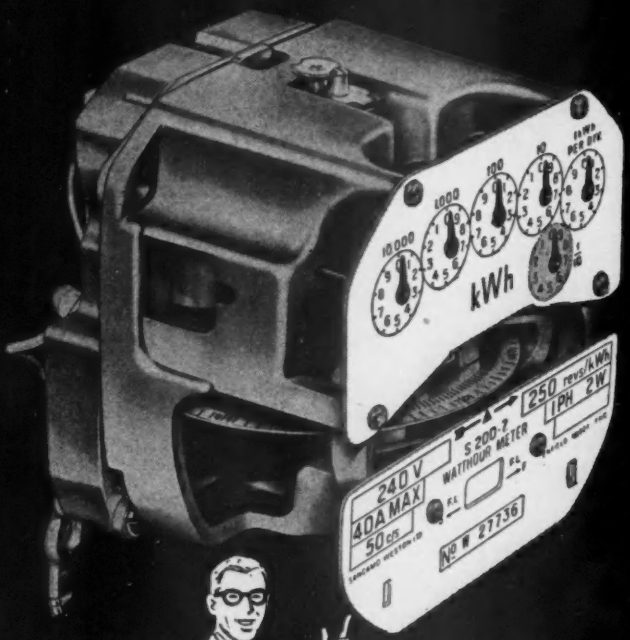

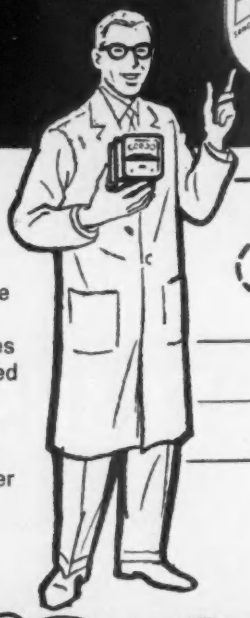

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Trunk Road Lighting—A.6 Duffield Road

TENDERS are invited for the supply and erection of 34 Concrete Columns and 17 Steel Brackets on existing trolley poles complete with 140 watt Sodium Lamp Lanterns.

Specification, Bill of Quantities and Form of Tender may be obtained from the Clerk to the Council, on payment of a deposit of £2 which will be refunded on receipt of a bona fide tender.

Tenders to be returned in plain sealed envelopes endorsed "Trunk Road Lighting—Parish of Allestree" to the undersigned not later than 1 Nov., 1961.

ALBERT H. ALTON,
Clerk.

36 Bridge St,
Belper,
Derbys. (C 334)

MATLOCK URBAN DISTRICT COUNCIL

Street Lighting—Trunk Road A.6 from Masson Mills, Matlock Bath, to the 30 m.p.h. limit, Derby Road, Cromford.

TENDERS are invited for the provision and erection of 28 Group "A" lighting units consisting of steel columns, 140 watts sodium discharge lamps and auxiliary equipment, etc., on the above road.

General conditions of contract and plans may be inspected during office hours and specification, bills of quantities and form of tender obtained from Mr N. Chamberlain, Engineer and Surveyor, Town Hall, Matlock, on payment of a deposit of £2 2s, which will be refunded upon receipt of a bona fide tender.

Tenders in plain sealed envelope, endorsed "Tender for Street Lighting," must be delivered to the undersigned not later than 12 noon on 3 Nov., 1961.

The Council do not bind themselves to accept the lowest or any tender.

J. OWEN HUNT,
Clerk and Solicitor.

Town Hall,
Matlock.
4 Oct., 1961. (C 313)

COUNTY BOROUGH OF SUNDERLAND

Sunderland Technical College

South Johnson Street

TENDERS are invited for the Electrical Installation into the above, estimate of cost £45,000 (exclusive of electricity service charge), from firms capable of carrying out this size of contract in a limited time programme from December, 1961, to September, 1962.

The Technical College comprises a six-storied main block, three-storied east block, two-storied lecture theatre block, single-storied heavy laboratory block, and single-storied radioactive techniques block.

Tender documents obtainable from Borough Architect, Grange Hse, Stockton Rd, Sunderland, on payment of £2 2s deposit, returnable on receipt of a bona fide tender. Cheques payable to "Sunderland Corporation."

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Sealed tenders endorsed "Tender for Electrical Installation—Technical College, South Johnson Street," must be received at my office, Town Hall, not later than 12 Nov., 1961.

G. S. McINTIRE,
Town Clerk.
(C 338)

APPOINTMENTS VACANT

THE SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following positions:

West Wales Area

(a) COMMERCIAL ASSISTANT
PEMBROKESHIRE DISTRICT (TENBY)
(Reference 130/61/ET)

Salary: N.J.B. Class F, Grade 7, Scale 8, £1,040/£1,165 per annum.

(b) ASSISTANT ENGINEER
PEMBROKESHIRE DISTRICT
(HAVERFORDWEST)
(Reference 131/61/ET)

Salary: N.J.B. Class F, Grade 11, Scale 4, £765/£870 per annum.

(c) ASSISTANT ENGINEER
SOUTH CARDIGANSHIRE DISTRICT
(CARDIGAN)
(Reference 13/61/ET. Re-advertised)

Salary: N.J.B. Class E, Grade 10, Scale 4, £765/£870 per annum.

Preference will be given to Engineers possessing the Higher National Certificate in Electrical Engineering.

Applications stating age, present position, present salary, qualifications, experience and endorsing envelope with the appropriate reference, should be addressed to E. Broughton, A.M.I.E.E., Manager, West Wales Area, South Beach Pavilion, Tenby, to arrive not later than 4 Nov., 1961.

R. G. WILLIAMS,
Secretary.
(C 352)

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

FOURTH ASSISTANT ENGINEER (RELIEF)

REQUIRED in the System Operation Department and the duties will consist of relieving the Third Assistant Engineer (Control) on shift, in all control duties pertaining to the Birmingham Grid Control Area. When not required for relief duties he will assist in the Statistics and Costing Section of the System Operation Department.

N.J.B. service conditions, superannuable appointment. Salary according to Grade 10, Class L, £995/£1,190/£1,325 per annum.

Applicants should have had sound technical training to the standard of the Higher National Certificate and have had operating experience within the supply industry.

Apply, quoting vacancy number 230/61 MR on form AE6, available from the System Operation Engineer, Warwick Hse, Redhill Rd, West Heath, Birmingham 31, to be returned by 30 Oct., 1961. (C 363)

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Region

FOURTH ASSISTANT ENGINEER
(SURVEYOR)
REGIONAL TRANSMISSION PROJECT
BRANCH

APPLICATIONS are invited from qualified Surveyors to undertake the surveying and profiling of 275 kV and 132 kV overhead line routes.

Candidates should be conversant with this kind of work and be able to prepare level grids for substation sites.

The salary for the appointment will be in accordance with the National Joint Board Agreement, Grade 11, Class K (£800/£1,165 per annum).

Forms of application may be obtained from the Regional Personnel Officer, Central Electricity Generating Board, North Eastern Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned to arrive not later than 3 Nov., 1961. (C 366)

SOUTH WESTERN ELECTRICITY BOARD

SENIOR COMMERCIAL ASSISTANT
(MOBILE SALES)
PLYMOUTH DISTRICT

SALARY: within Grade 5, £1,020/£1,140 per annum of the N.J.C. Agreement.

The successful candidate will be required to supervise and train in the field a team of approximately 18 Sales Representatives whose individual results will be his particular concern. He should have a good knowledge of electrical appliances, domestic and commercial installations, and the applications of electricity to water heating and space heating. A knowledge of the Board's sales policies and procedure is desirable.

The ability to drive a motor vehicle is most desirable.

Applications for this post to be made on Standard Form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, Elliott Rd, Prince Rock, Plymouth. Closing date for receipt of completed applications is 4 Nov., 1961. (C 353)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Region

North Thames Division

APPLICATIONS are invited for the following appointment in the System Operation Department, Thames North Grid Control Centre, Redbourn, near St. Albans, Herts.

THIRD ASSISTANT ENGINEER
(S.V. No. 1516)

Salary: N.J.B. Class K, Grade 8, Scale 11, £1,145/£1,410 per annum, plus 10% Shift Allowance.

The commencing salary will be within the above range at a point commensurate with qualifications and experience. The minimum technical qualification required is the Higher National Certificate in Electrical Engineering.

Some generating station and/or transmission/technical experience is essential. The successful applicant will be required to undertake shift duties in the Grid Control Room.

Forms of application (AE.6/ACT) may be obtained from the Board's Headquarters, or from any Divisional Offices of the Board, and should be addressed to the Assistant Regional Personnel Officer, Central Electricity Generating Board, North Thames Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts, to arrive not later than 28 Oct., 1961, quoting reference S.V. No. 1516.

F. W. SKELCHER,
Assistant Regional Director.
(C 373)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 46s. per inch, and all other classified advertisements at 3s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

AIR MINISTRY WORKS DEPARTMENT

INVITES applications for positions as STATION ENGINEERS Grade III at R.A.F. and Ministry of Aviation establishments throughout the United Kingdom to supervise the installation, operation and maintenance of electrical and/or mechanical plant.

Salary, which is dependent upon age, quals. and exp., ranges in the U.K. from £801 (National Rate) at age 25 to £988 max. in Grade III.

Quals. and exp. Applicants, who must be natural-born British subjects up to age 35, should have served an apprenticeship and should hold an ONC or C. and G. Technical Cert. or Second Class M. of T. Cert. or equiv. Experience is required in one or more of the following:

Electrical Generation.

Electrical Distribution, H.T. and L.T.

Electrical Installations, Industrial and Domestic.

Light Current and/or Electronic Engineering.

Ventilation and Air Conditioning.

Heating and hot water supply.

Compressed gases and refrigeration.

Bulk fuel installation.

Diesel engine-driven plant.

Internal training courses provided and financial assistance and time off may be allowed for recognised courses of study leading to higher quals.

Prospects. Appointments are non-pensionable but retirement/resignation gratuity payable after five years' or more service. Excellent opportunities of obtaining permanent pensionable posts (with all service) counting) and of advancement to the higher grades in which posts number 480 approx. Higher grade salaries vary between £988 and £1,747 p.a. (National Rate) and vacancies are, as a rule, filled by promotion of serving staff. Opportunities for overseas tours for which special allowances ranging at present up to £1,800 p.a. are payable in addition to a higher salary. Five-day week with 26½ days' paid leave a year initially, including public holidays.

Forms from Manager (PE.1), Ministry of Labour, Professional and Executive Register, Atlantic Hse, Farringdon St, London E.C.4. Candidates selected will normally be interviewed in London and certain expenses reimbursed. Only applicants selected for interview will be advised. (C 180)

CENTRAL ELECTRICITY GENERATING BOARD

Western Division

GENERAL ASSISTANT ENGINEER

(OPERATION)

REQUIRED AT PORTISHEAD "B"

GENERATING STATION

W/AV/97/61.

SUPERANNUATION Scheme. Salary: N.J.B. Class K, Grade 13, Scale 6, £890/£1,015 p.a., plus 10% shift enhancement (minimum £90).

Candidates should preferably hold, or be studying for, a Higher National Certificate or similar qualification.

ASSISTANT ENGINEER (OPERATION)

REQUIRED AT BERKELEY NUCLEAR

POWER STATION

W/AV/98/61.

Superannuation Scheme. Salary: N.J.B. Class M, Grade 12, Scale 9, £1,115/£1,245 p.a., plus 10% shift enhancement.

Applicants should preferably hold a Higher National Certificate in Mechanical or Electrical Engineering or equivalent qualifications. Experience in modern power station operations will be an advantage.

The successful candidate will be engaged initially on plant inspection and commissioning work, subsequently transferring to reactor control duties.

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Opportunity will be given for training in nuclear power techniques to fit candidate for more senior appointments.

ASSISTANT SHIFT CHARGE ENGINEER

REQUIRED AT BERKELEY NUCLEAR

POWER STATION, BERKELEY, GLOS

W/AV/99/61.

Superannuation Scheme. Salary: N.J.B. Class M, Grade 8, Scale 13, £1,440/£1,610 p.a., plus 10% shift allowance.

Applicants should preferably possess the necessary technical qualifications for admission to corporate or graduate membership of a senior engineering institution.

Experience in a modern conventional power station is essential.

The successful applicant will be required to attend a course of theoretical and practical training of approximately six months' duration prior to taking up his appointment.

GENERAL ASSISTANT CHEMIST

REQUIRED AT BERKELEY NUCLEAR

POWER STATION

W/AV/100/61.

Superannuation Scheme. Salary: N.J.B. Class M, Grade 14, Scale 7, £965/£1,090 per annum.

Candidates should preferably possess a Higher National Certificate in Chemistry or equivalent, together with some industrial experience. Knowledge and/or practice in radio-chemistry would be an advantage.

The successful applicant will be one of a team supplying chemical services to the Nuclear Power Station, calling for a sound theoretical knowledge and a practical approach to a variety of chemical problems.

Applications on Form AE6/ACT, obtainable from the Personnel Department, 26 Oakfield Rd, Bristol 8, should be completed and returned by 31 Oct., 1961. (C 368)

THE EAST MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited from suitably qualified and experienced persons for the following appointment. Applicants should state age, qualifications, experience, etc., and quote the Vacancy Number.

Leicester Sub-Area

FOURTH ASSISTANT DISTRICT ENGINEER

EAST DISTRICT

Re-advertised

Vacancy No. 92/61.

Salary: N.J.B. Class F, Grade 12, £715/£805 per annum.

The duties will include assisting in the operation, maintenance, planning and construction of rural and urban networks up to and including 11 kV.

The successful applicant will be required to reside in or near to Leicester, and to undertake standby duties.

Applications should be forwarded to the Manager, Leicester Sub-Area, Charles St, Leicester, by 3 Nov., 1961. (C 348)

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

DEPUTY POWER STATION

SUPERINTENDENT

REQUIRED for Stourport "A" and "B" Power Stations. N.J.B. service conditions, superannuable appointment, salary in accordance with Schedule A, Grade K2, £1,920/£2,085 per annum.

Candidates should have a wide experience in the operation and maintenance of a large modern power station and should have sound administrative ability. The possession of a University degree in engineering or corporate membership of the Institution of Electrical or Mechanical Engineers will be an advantage.

Apply, quoting vacancy No. 228/61 MR on form AE6, available from the Station Superintendent, Stourport Power Station, Severn Side, Stourport-on-Severn, Worcs, to whom they should be returned, to arrive not later than 3 Nov., 1961. (C 361)

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

SHIFT CHARGE ENGINEER

REQUIRED at Warwick Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade E.7, £965/£1,090 per annum, plus 10% shift allowance.

Applicants should have a sound technical training and practical experience in the operation and maintenance of steam generating plant and main switchgear. Appropriate technical qualifications will be an advantage.

Previous applicants will be reconsidered and need not re-apply.

Apply, quoting vacancy number 226/61 MR, on form AE6, available from the Station Superintendent, Warwick Power Station, Emscote Rd, Warwick, to whom they should be returned to arrive by 30 Oct., 1961. (C 362)

YORKSHIRE ELECTRICITY BOARD

No. 4 (Leeds) Sub-Area

SECOND ASSISTANT ENGINEER

(DISTRIBUTION DESIGN)

APPLICANTS should have had experience in the design, construction and operation of large scale networks, the preparation of technical reports and the assessment of load growth and development.

Salary: N.J.B. Class L, Grade 7 (Scale 13), £1,440/£1,610 per annum.

FOURTH ASSISTANT ENGINEER

(METERS TESTING AND PROTECTION)

(TWO POSTS)

The successful applicants will be required to assist with the testing of protective gear, the commissioning of new plant and equipment, the testing of h.v. metering schemes, the testing of instruments and instrument transformers and with technical calculations.

Salary: N.J.B. Class L, Grade 13 (Scale 7, £965/£1,090 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, Leeds, not later than 3 Nov., 1961.

No. 1 (Bradford) Sub-Area

DEMONSTRATOR

Candidates should have had Domestic Science Training, including Electrical Housecraft, and should preferably hold the E.A.W. Certificate or Diploma. They should be competent to lecture and advise consumers on the utilisation of Domestic Electrical Appliances and be able to give demonstrations with a sales emphasis. The successful applicant will be located at Bradford, but may be required to work throughout the Sub-Area if the occasion demands.

Salary: N.J.C. Grade 1, £600 x £25—£700 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53 Sunbridge Rd, Bradford, not later than 3 Nov., 1961. (C 354)

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

THIRD ASSISTANT ENGINEER (CONTROL)

REQUIRED to assist the Grid Control Engineer on shift in all control duties pertaining to the Birmingham Grid Control Area.

N.J.B. service conditions, superannuable appointment, salary according to Grade 8, Class L, £1,165/£1,350/£1,500 per annum, plus 10% for shift duties.

Applicants should have had sound technical training to the standard of the Higher National Certificate, and have had operating experience within the supply industry.

Apply, quoting vacancy number 229/61 MR on form AE6, available from the System Operation Engineer, Warwick Hse, Redhill Rd, West Heath, Birmingham 31, to be returned by 30 Oct., 1961. (C 360)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Region

North Thames Division

APPLICATIONS are invited for the following appointment:

GENERAL ASSISTANT ENGINEER
NORWICH GENERATING STATION
(NORFOLK)
(S.V. No. 1548)

Salary: N.J.B., Class F, within the range of Grades 14/12, Scales 1/3, £625/£805 p.a., plus 10% Shift Allowance when required to work on shift.

The duties of the successful applicant will include assisting in the Control Room on shift and other operation and investigation duties.

The commencing salary will depend upon qualifications and the duties and responsibilities.

Preference will be given to applicants who have had previous experience in a generating station and who have reached the standard of the Ordinary National Certificate in Electrical Engineering or its equivalent.

Applications, quoting reference S.V. No. 1548, stating age, qualifications, experience and present position, should be sent to the Personnel Officer, Central Electricity Generating Board, South Eastern Region, North Thames Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts, to arrive not later than 28 Oct., 1961.

F. W. SKELCHER,
Assistant Regional Director.
(C 339)

CHRISTCHURCH CITY COUNCIL
CHRISTCHURCH, NEW ZEALAND

APPLICATIONS are invited for the position of

GENERAL MANAGER
MUNICIPAL ELECTRICITY DEPARTMENT
CHRISTCHURCH, NEW ZEALAND

Applicants should have received a thorough training in electrical engineering and have had considerable experience in administration. Consideration will be given to the claims of an applicant who submits evidence of administrative ability or administrative or accountancy qualifications, in addition to his basic training in electrical engineering.

Application forms and conditions of appointment may be obtained from the Town Clerk, Christchurch City Council, P.O. Box 237, Christchurch, New Zealand, or from the office of Preece, Cardew and Rider, 8, 10 and 12 Queen Anne's Gate, Westminster, London S.W.1.

Applications will close with Preece, Cardew and Rider on 15 Nov., 1961.
(C 330)

THE UNIVERSITY OF MANCHESTER

ELECTRICAL ENGINEER

APPLICATIONS are invited for the position of Electrical Engineer in the Buildings Section of the Bursar's Department. The person appointed will be responsible for the maintenance of electrical services throughout the University and for minor alterations and additions to electrical installations.

Applicants should be Chartered Electrical Engineers or have other approved professional qualifications. Salary in the range £1,600/£1,850 per annum, according to qualifications and experience. In addition, a child allowance (£50 per annum for each child in receipt of full-time education) is payable. The post carries membership of the Federated Superannuation System for Universities.

Further particulars may be obtained from the Bursar, The University, Manchester 13, to whom applications should be sent as soon as possible. (C 278)

LONDON ELECTRICITY BOARD

APPRENTICES' INSTRUCTOR

APPLICATIONS are invited for a post as Apprentices' Instructor at the Board's Training Centre at 57 Pratt St, Camden Town, N.W.1.

The Instructor will work under the Senior Apprentice Instructor, should have been a skilled craftsman with some previous experience in instructing, and be capable of teaching any of the basic workshop skills with hand tools. In particular, he should be able to deal with instruction in bench fitting and sheet metal work. Experience of workshop processes generally and the possession of trade or technical qualifications will be an advantage.

The post is graded under Schedule A of the National Joint Board Agreement, Class K (Area), as Grade 11, and the commencing salary will be within the range £950 per annum to £1,215 per annum, inclusive of London Allowance. The successful candidate will be required to work such hours as may be necessary in order effectively to supervise apprentices under instruction.

Application form obtainable from the Personnel Officer, 46 New Broad St, London E.C.2, to be returned completed within 14 days of the publication date of this notice. Please quote ref.: PER/V/3428.T. (C 332)

CITY OF STOKE-ON-TRENT

City Architect's Department

APPLICATIONS are invited for the following appointments to form a new Electrical Engineering Group in the City Architect's Department.

(a) SENIOR ASSISTANT ELECTRICAL ENGINEER

Grade A.P.T.V., £1,310/£1,480.

(b) TWO ASSISTANT ELECTRICAL ENGINEERS

Grade A.P.T.III, £960/£1,140.

The person appointed to post (a) will be in charge of the Electrical Engineering Group and should preferably hold Corporate membership of the I.E.E., or Degree standard and wide experience in installation and contracting work.

Candidates for posts (b) should be properly trained electrical engineers of not less than Higher National Certificate standard.

Applicants must have had design and estimating experience as consumers' or contracts' engineers and be capable of preparing designs and specifications for electrical installations for buildings, including housing, schools and other public buildings.

Previous local authority experience desirable but not essential. Commencing salaries within the above grades according to qualifications and experience.

Applications, giving details of qualifications, training and previous experience and names of two referees, to be sent to J. R. Piggott, T.D., F.R.I.B.A., City Architect, Kingsway, Stoke-on-Trent, not later than Friday, 3 Nov., 1961.

HARRY TAYLOR,
Town Clerk.
(C 329)

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

SHIFT CHARGE ENGINEER

REQUIRED at Hams Hall "C" Power Station, near Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade K6, £1,440/£1,610 per annum, plus 10% shift allowance.

A sound technical training and practical experience in the operation and maintenance of steam generating plant and main switchgear in a large modern power station are required, also a knowledge of P.F. firing. The station is one of advanced design. Appropriate qualifications an advantage.

Apply, quoting Vacancy Number 220/61 MR on form AE6, available from the Station Superintendent, Hams Hall Power Station, Lea Marston, Sutton Coldfield, Warwicks, by 30 Oct., 1961. (C 340)

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

ASSISTANT ENGINEERS (CONTROL)
(RELIEF)

REQUIRED at Hams Hall "A" and "B" Power Stations, N.J.B. service conditions, superannuable appointments, salary within Schedule A, Grade K.14, £825/£940 per annum.

These engineers will be expected to carry out shift relief duties and when not so employed will be available to undertake duties in the maintenance and operation departments. Shift allowance as laid down in the N.J.B. Agreement will be paid when shift duties are worked. Applicants should have received a sound technical training and appropriate qualifications will be an advantage.

Apply, quoting Vacancy Number 223/61 MR on form AE6, available from the Station Superintendent, Hams Hall Power Stations, Lea Marston, Sutton Coldfield, Warwicks, to whom they should be returned when completed not later than 30 Oct., 1961. (C 342)

Eastern Electricity

Chilterns Sub-Area

DEMONSTRATOR—NORTHWOOD DISTRICT

215/61.R.

CANDIDATES should have had domestic science training including electrical housecraft: should preferably hold the E.A.W. Certificate and be competent to plan and give cookery demonstrations including lectures and to help housewives to select, buy and use efficiently appliances most suited to their needs.

Salary: N.J.C. Grade 1, £600/£700 plus London Weighting.

Apply by letter to the Manager, Northwood District, Eastern Electricity Board, 1 Love La, Pinner, by 20 Nov., 1961.

Fens Sub-Area

FITTER (ELECTRICAL)
PROTECTION SECTION

216/61.R.

Applications are invited for the position of Fitter (Electrical) to work with the Sub-Area Protection Section based at Thompsons La, Cambridge.

Duties will include work in connection with the testing and commissioning of substations and protective gear over the whole Sub-Area.

N.J.I.C. rates and conditions. Present rate: 5s 6¼d for 42-hour five-day week.

Apply by letter to the Secretarial Officer, Fens Sub-Area, Eastern Electricity Board, Milton Hall, Cambridge, by 3 Nov., 1961.
(C 346)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Region

FOURTH ASSISTANT ENGINEER
(DRAWING OFFICE) ELECTRICAL

APPLICATIONS are invited for the position of Fourth Assistant Engineer—Drawing Office in the Regional Electrical Engineer's Department.

Candidates should possess a sound practical and technical training, and have experience in the layout of electrical equipment.

The work consists of preparation of drawings associated with the construction of H.V. Substations.

Superannuable appointment, commencing salary according to qualifications and experience within the range £920/£1,245 per annum.

Apply, quoting vacancy number 225/61 MR on form AE.6, available from the Regional Personnel Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 30 Oct., 1961. (C 341)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Region

North Thames Division

APPLICATIONS are invited for the following appointment:

MAINTENANCE ENGINEER

(ELECTRICAL)

TILBURY GENERATING STATION

(ESSEX)

(S.V. No. 1552)

Salary: N.J.B. Class K, Grade 6, Scale 13, £1,440/£1,610 per annum, plus London Weighting £60 per annum.

Applicants should have served an apprenticeship and have had experience with the maintenance of modern pulverised fuel fired boilers, turbines and coal and ash handling plants. Operating and supervisory experience and appropriate technical qualifications will be an advantage.

Applications, quoting Reference S.V. No. 1552, stating age, qualifications, experience and present position, should be sent to the Assistant Regional Personnel Officer, Central Electricity Generating Board, North Thames Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts, to arrive not later than 4 Nov., 1961.

F. W. SKELCHER,
Assistant Regional Director.
(C 374)

'ENGLISH ELECTRIC'

CONTROL ENGINEERING ESTIMATING DEPARTMENT

The continued expansion of the activities of the Control Gear Division has created a vacancy for a Control Gear Estimator. His duties include the preparation of Unit estimates from drawings, and complete schemes including these units to Engineers' instructions.

Suitable applicants should be of O.N.C. standard with experience of "one-off" or small batch production in the motor control or industrial electronics field.

The Works is pleasantly situated on the Staffordshire/Cheshire border: there are now a large number of houses available for renting to employees, and assistance with removal expenses can be given in certain cases. Applications should be made in writing, giving details of age, qualifications and experience, quoting reference **ET/394L**, and be addressed to the

Director, Group Personnel Services, English Electric House, Strand, London W.C.2. (C 335)

'ENGLISH ELECTRIC'

A leading Midlands manufacturer of electric wiring accessories is seeking a Senior Designer having experience in the field of light electro-mechanical devices, for which an appropriate salary will be paid. The position offers adequate scope for initiative and originality under congenial working conditions with usual benefits. Replies, which will be treated with absolute confidence., should be addressed to:

The Technical Director, J. A. CRABTREE AND CO. LTD., Lincoln Works, Walsall.
(C 371)

FALKLAND ISLANDS GOVERNMENT

South Georgia

ASSISTANT DIESEL ELECTRIC MECHANIC

REQUIRED for service in South Georgia for one tour of 2-2½ years in first instance. Salary £540 a year. Gratuity at rate of £10 for each completed month of residential service. The officer will be provided with free furnished accommodation and with free fuel and lighting. Meals will also be free. Free passages. Liberal leave on full salary. Candidates, single and under 40 years of age, must be able to repair and maintain diesel electric (a.c.) generators up to 75 kW and service electrical equipment. Apply to CROWN AGENTS, 4 Millbank, London S.W.1, for application form and further particulars, stating age, name, brief details of qualifications and experience and quoting reference M2A/51446/EE. (C 372)

SOUTHERN ELECTRICITY BOARD

PLANNING ENGINEER

HESTON District of No. 1 (Southall) Sub-Area. Salary: N.J.B. Class H, Grade 7 (£1,190/£1,325 per annum, plus £50 per annum London Allowance). N.J.B. Condition of Service.

The duties will include preparation of schemes and estimates for extensions and/or reinforcements to overhead and underground networks up to and including 11 kV. The appointment will involve standby duties.

The successful applicant will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 2-6 Windmill La, Southall, Middx, and returned to him, quoting Z.1393, not later than 30 Oct., 1961. (C 357)

ASSISTANT ELECTRICAL ENGINEER in consulting engineer's London office. Design drawing, supervision of electrical installations in schools, hospitals, factories, etc. Five-day week, superannuation, salary range £800/£1,000 p.a. Apply in writing: R. W. Gregory and Ptnrs, 42 Kingsway, W.C.2. (C 345)

INSPECTING ENGINEER

Required by Consulting Engineers to be based on their Manchester (Didsbury) Office, but candidates must be willing to spend periods of service elsewhere in the U.K. and abroad. Applicants should have had a sound electrical engineering training with subsequent experience mainly in the switchgear field. They must also possess at least Graduate Membership of the I.E.E. Salary and prospects would be commensurate with the character of the appointment. Application forms are obtainable from Staff Appointments, Kennedy and Donkin, 813A Wilmslow Rd, Manchester 20. (C 324)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Region

APPLICATIONS are invited for the following superannuable post. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London Allowance.

FOURTH ASSISTANT ENGINEER

MEASUREMENTS SECTION

ELECTRICAL DEPARTMENT

CHURCHFIELDS RD

BECKENHAM, KENT

Vacancy No. 61/619.

The successful candidate will be required to calibrate and test either polyphase meters and all types of indicating and recording instruments, or various types of electronic measuring instruments. Candidates should have H.N.C.(E) or its equivalent, but consideration will be given to those holding O.N.C.(E) providing they have adequate experience of the work outlined above and are continuing their studies.

Salary: Class K (Division), Grade 11, £950/£1,215 per annum or Grade 10, £1,030/£1,295 per annum according to qualifications and experience.

Applications, quoting vacancy number to (or on form from) Personnel Department, Central Electricity Generating Board, P.O. Box No. 136, London W.1, to be received not later than 31 Oct., 1961. (C 336)

THE GENERAL ELECTRIC COMPANY LIMITED

has vacancy for a

SENIOR TEST ENGINEER

in their Power Plant Division based at Erith, Kent.

The work involves efficiency testing and performance investigation of large Turbo Alternators, Blower and Compressor Plant in the U.K. and Overseas, together with submission of test reports.

Applicants should have had thorough experience in this field.

The post offers good prospects for a man with ability and initiative.

There is a superannuation fund and life assurance scheme.

Apply, giving particulars of age, education and experience to Personnel Manager, The General Electric Co. Ltd., Erith, Kent.
(C 344)

AEI A.E.I. LAMP AND LIGHTING CO., LTD.

DESIGN ENGINEER

A.E.I. Lamp & Lighting Company require an engineer for their Lighting Engineering Department at Hereford, to work on the design and development of discharge lamp ballasts.

Technical qualifications to HNC standard are desirable and experience in this type of work would be an advantage.

Apply, giving details of age, experience and technical qualifications, to:

The Personnel Officer, A.E.I. Lamp & Lighting Co., Ltd., Rotherwas Works, Hereford
(C 347)

You'll find room to expand with

'ENGLISH ELECTRIC'

FRACTIONAL HORSE POWER MOTOR DIVISION

SENIOR DESIGN AND DEVELOPMENT ENGINEERS

As a result of the expanding field of application of F.H.P. motors, The English Electric Company are about to make senior appointments to their Design and Development Department.

Qualified engineers experienced in this field, who are interested in developing and applying modern design methods possibly including the use of a digital computer are invited to submit details of their technical education, training and experience, quoting reference number ET 0097B.

These appointments will be of particular interest to men seeking opportunities for greater responsibility.

Please reply to Technical Staff Officer, Dept. G.P.S., English Electric House, Strand, London, W.C.2

(C 382)

'ENGLISH ELECTRIC'

EAPL

have the undernoted vacancies in

KENYA COLONY

MAINS ENGINEERS

Applicants (age 28-40 years) should be at least Graduate I.E.E. standard. Fully conversant with construction, maintenance and operation of distribution networks, including surveying, profiling and estimating. Experience in street lighting erection and house wiring problems an advantage. Ability to control staff essential.

ELECTRICAL TECHNICIAN

Applicants (age 28-35 years) should possess equivalent of City and Guilds Electrical Technicians' certificate and have a sound knowledge of the erection and maintenance of heavy electrical plant, including rotating electrical machinery, transformers, switchgear protection, control circuits and associated equipment.

CONTROL ENGINEER

Applicants should be at least 28 years of age and possess an O.N.C. (Elec. Eng.) or equivalent. Experienced on H.T. Mains work, control centre and power station operation. They must be familiar with the construction of different types of switchgear and ancillary equipment including protection systems.

The vacancies offer progressive permanent positions in the following salary scale:

MAINS ENGINEERS	**£1,335 x £42 to £1,545**	**per annum**
ELECTRICAL TECHNICIAN	**£1,209 x £42 to £1,419**	**per annum**
CONTROL ENGINEER	**£1,335 x £42 to £1,545**	**- EB -**
	£1,587 x £42 to £1,797	**per annum**

Four year tours—six months paid home leave. Free furnished housing. Contributory Pension Scheme. Generous Family Medical Scheme. Children's Education Allowance. Free Life Assurance and Widows' Pension Fund.

Write details age, qualifications, experience, present post and salary to:

THE LONDON SECRETARY, EAST AFRICAN POWER AND LIGHTING CO., LTD., BOW BELLS HOUSE, BREAD ST., LONDON, E.C.4.

(C 337)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Region

East Midlands Division

ASSISTANT ENGINEER (OPERATION)

CASTLE DONINGTON POWER STATION

Vacancy No. 225/61.

APPLICATIONS are invited for the position of Assistant Engineer (Operation) of Castle Donington Power Station, Castle Donington, nr. Derby.

Candidates should have had operating experience on large modern pulverised fuel fired boilers and associated turbines.

Salary will be in accordance with Class L, Grade 10 (£1,190/£1,325 per annum), of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 27 Oct., 1961.

This appointment is pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Station Superintendent and should be returned to him by the date stated.

O. S. WOODS,
Assistant Regional Director.
(C 358)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

Headquarters

THIRD ASSISTANT ENGINEER (METERS)
(METER TESTING STATION, ASTON FIELDS, BROMSGROVE, WORCS)

Applicants should possess technical qualifications to H.N.C. standard and have a sound experience in modern repair and testing methods for single-phase and three-phase meters. The duties will consist of the supervision of the Meter Repair and Test Sections at the Aston Fields Meter Testing Station, dealing with all types of single- and three-phase meters, time switches and instruments. Salary within the range £1,145/£1,410 per annum (N.J.B. Grade K.8).

GENERAL ASSISTANT ENGINEER (METERS)
(METER TESTING STATION, ASTON FIELDS, BROMSGROVE, WORCS)

Duties will include the testing of three-phase metering equipments and assisting in the commissioning, routine testing and maintenance of bulk supply metering equipments. Applicants should possess suitable technical qualifications and have had a satisfactory training in metering. Salary within the range £675/£870 per annum (N.J.B. Grade K.15).

Apply, by letter, within 14 days, stating age, experience, present position and salary, to the Secretary, Midlands Electricity Board, P.O. Box No. 8, Mucklow Hill, Halesowen, nr. Birmingham.

Birmingham Area

SECOND ASSISTANT DISTRICT ENGINEER
(SUTTON COLDFIELD AND NORTH EAST DISTRICT)

Extensive experience necessary with high voltage, medium voltage and protective systems. Applicants should have technical qualifications commensurate with eligibility for Associate Membership of the I.E.E. Salary: £1,350/£1,500 per annum (N.J.B. Grade K.7). Apply, by letter, within 14 days, stating age, experience, qualifications, present position and salary, to Emil Braathen, Area Manager, Midlands Electricity Board, 14 Dale End, Birmingham 4.

F. W. CATER,
Secretary.
(C 343)

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable positions in a large showroom to be opened shortly in Glasgow.

1. DISPLAY ASSISTANT (Ref. C16/61)

Applicants must have considerable experience in large store and exhibition display, be thoroughly conversant with up-to-date display techniques and materials and capable of creating and installing modern displays. A knowledge of the electrical industry is preferable, but not essential. A selling background will be an advantage.

Salary: £890/£1,010 per annum.

2. SENIOR SERVICE CENTRE ASSISTANTS (TWO) (Ref. C17/61)

Applicants must have a first-class selling background in a large organisation, be capable of controlling staff, and training junior staff. Experience in the electrical industry is essential and a thorough knowledge of modern electrical appliances is necessary. The holding of the E.D.A. Salesmanship Diploma will be an advantage.

Salary: £780/£880 per annum.

3. SENIOR DEMONSTRATOR (FEMALE) (Ref. C18/61)

Applicants must be fully experienced in public demonstration work, be capable of supervising a large demonstration theatre, and of training young demonstrators. A domestic science qualification and a thorough knowledge of modern electrical appliances are essential. Sales experience will be an advantage, as also will the E.A.W. Demonstrators' Certificate.

Salary: £700/£775 per annum.

4. DEMONSTRATOR FEMALE) (Ref. C19/61)

Applicants must be experienced in presenting public demonstrations and capable of assisting the Senior Demonstrator in supervising the theatre and training staff. A knowledge of electrical appliances is necessary as also is a domestic science qualification. Sales experience will be an advantage.

Salary: £600/£700 per annum.

Applications giving age, details of experience, qualifications, etc., and quoting appropriate reference, should be submitted to the Secretary, South of Scotland Electricity Board, Inverlair Ave, Glasgow S.4, not later than 30 Oct., 1961. (C 331)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Region

REGIONAL RESEARCH AND DEVELOPMENT DEPARTMENT

APPLICATIONS are invited for the following positions in the above Department, located at West Farm Pl, Chalk La, Cockfosters, Herts, unless otherwise indicated. Salaries, inclusive of London Allowance, will be within the ranges described, dependent on experience, in accordance with Class L of the N.J.B. Agreement.

MECHANICAL AND THERMODYNAMICS BRANCH

(a) FOURTH ASSISTANT ENGINEER

Vacancy No. SE 49/61.

Duties will be to assist in carrying out investigational work at power stations and in a laboratory. Applicants should have a Degree or Higher National Certificate and some experience of power plant. Opportunity will be given to obtain further experience with a variety of projects, and there are good promotion prospects.

ELECTRICAL BRANCH

(b) THIRD ASSISTANT ENGINEER

Vacancy No. SE 50/61.

The successful candidate will be responsible to the transmission Section Head and will assist in the electrical laboratory and with field work in technical problems concerning electrical transmission plant, including overhead lines, underground cables and switching and transforming equipment. Applicants should have a sound technical training with experience in electrical power

continued in next column

continued from previous column

system work. A recognised electrical engineering qualification leading to Corporate Membership of the Institution of Electrical Engineers is essential, and a University Degree would be an advantage.

(c) FOURTH ASSISTANT ENGINEER

Vacancy No. SE 51/61.

The successful candidate who will be assisting in carrying out automatic control research, will be based initially at Croydon Generating Station and will be expected to reside within a reasonable distance of his place of work. A knowledge of the operation and design of electrical plant in a generating station is necessary, and experience in instrumentation techniques and a recognised qualification leading to Corporate Membership of the Institution of Electrical Engineers would be an advantage.

Salary: Posts (a) and (c) Grade 9/10/11, £970/£1,460 p.a.; Post (b) Grade 6/7/8, £1,215/£1,780 p.a.

Applications, giving Vacancy No., age, qualifications, experience, etc., should be sent to the Regional Secretary, Central Electricity Generating Board, South Eastern Regional Headquarters, Ergon Hse, Horseferry Rd, S.W.1, to be received by 31 Oct., 1961. (C 350)

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT ENGINEER

HERNE BAY/CANTERBURY DISTRICT

SALARY: £1,040/£1,165 per annum under N.J.B. Agreement, Class F, Grade 7 (Scale 8). Superannuable. Applicants should be suitably qualified and have operational experience of maintenance and construction on distribution systems up to 11 kV. A knowledge of planning work would be an advantage. Applications, quoting ET, and naming two referees, to the District Manager, Seeboard, 65 Mortimer St, Herne Bay, by 1 Nov., 1961.

ASSISTANT (ADMINISTRATION)

WOKING DISTRICT

Salary: £780/£880 p.a. under N.J.C. Agreement, Grade 3. Superannuable. Applicants should possess sound general knowledge of a district chief clerk's department with particular experience in insurance matters, transport returns and compilation of monthly progress statistics and personnel records. A knowledge of national agreements and conciliation machinery is essential. Applications, quoting ET, on forms from the District Manager, Seeboard, 4 Chobham Rd, Woking, by 1 Nov., 1961.

GEORGE WRAY,
Secretary.
(C 356)

THE BRITISH ELECTRICAL & ALLIED MANUFACTURERS' ASSOCIATION

APPLICATIONS from men aged not more than 30 are invited for the post of:

ASSISTANT

in a Department at Ascot largely concerned with heavy rotating plant. The main requirements are a good education, an ability to write clearly, intelligence and an agreeable manner.

The successful candidate would be expected, after an initial familiarisation with the background of the Department's work, to attend Committee meetings, record proceedings and work on the documents produced.

A technical qualification is not essential, but a background knowledge of the heavy side of the Electrical Industry could be an advantage. Sufficient interest in this field is essential to enable the holder of the post to handle technical terms with understanding.

A salary will be paid commensurate with qualifications and experience.

The post is permanent and pensionable.

Applications should be addressed to The Establishments Officer, BEAMA, 36 Kingsway, London W.C.2. (C 378)

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Region

THIRD ASSISTANT ENGINEER

(SUBSTATIONS AND CABLES)

REGIONAL TRANSMISSION PROJECT BRANCH

APPLICATIONS are invited from Engineers to supervise the work of contractors engaged in the installation of electrical plant including cables at 132 kV, 275 kV and 400 kV substations in the Region.

Candidates should have had previous experience on both the construction and maintenance of substation equipment but applicants with experience of either will be considered.

It is desirable that the candidates should have qualifications leading to corporate membership of the Institution of Electrical Engineers.

The salary for the appointment will be in accordance with the National Joint Board Agreement, Grade 8, Class K (£1,145/£1,410 per annum).

Forms of application may be obtained from the Regional Personnel Officer, Central Electricity Generating Board, North Eastern Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned to arrive not later than 3 Nov., 1961. (C 367)

COUNTY COUNCIL OF THE COUNTY OF LANARK

Property Department

ASSISTANT ELECTRICAL ENGINEER

REQUIRED for County Property Department, Motherwell. Salary Scale: £975/£1,055.

Applicants should preferably be graduates of Institution of Electricity Engineers, should have extensive knowledge of electrical design for Schools and other public buildings, have knowledge of electrical installation work and be able to prepare drawings and specifications.

There is a superannuation scheme and a five-day week operates.

Applications giving all necessary particulars together with names and addresses of two referees should be lodged with the undersigned within 14 days of the appearance of this advertisement.

IAN V. PATERSON,
County Clerk.

P.O. Box No. 1,
Lanarkshire Hse,
191 Ingram St,
Glasgow. (C 377)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Region

North Thames Division

APPLICATIONS are invited for the following appointment:

SHIFT CHARGE ENGINEER

LITTLE BARFORD GENERATING STATION

(ST. NEOTS, HUNTS)

(S.V. No. 1551)

Salary: N.J.B. Class J, Grade 6, Scale 12, £1,350/£1,500 per annum, plus 10% Shift Allowance.

Applicants should have served an apprenticeship and obtained a Higher National Certificate in Electrical or Mechanical Engineering, or equivalent qualification. Preference will be given to applicants who have had experience in the operation of large modern units utilising pulverised fuel.

Housing accommodation may be available for the successful applicant.

Applications, quoting reference S.V. No. 1551, stating age, qualifications, experience and present position should be sent to the Personnel Officer, Central Electricity Generating Board, North Thames Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts, to arrive not later than 28 Oct., 1961.

F. W. SKELCHER,
Assistant Regional Director.
(C 333)

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

ASSISTANT SHIFT CHARGE ENGINEER

REQUIRED at Ocker Hill Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade G.9, £965/£1,090 per annum, plus 10% for shift duties.

A sound technical training and practical power station experience are required in the operation of steam generating plant and main switchgear. Appropriate technical qualifications an advantage.

Apply, quoting vacancy number 231/61 MR on form AE6, available from the Station Superintendent, Ocker Hill Power Station, Ocker Hill, Tipton, Staffs. Closing date for receipt of applications: 30 Oct., 1961. (C 364)

SURREY EDUCATION COMMITTEE

Wimbledon Technical College

Gladstone Road, S.W.19

REQUIRED 1 Jan.:

LECTURER IN

ELECTRICAL ENGINEERING

with special reference to control systems; should have good teaching and industrial experience, and be prepared to teach to H.N.C. level and be responsible for servo-mechanisms. Salary: Burnham Technical Scale for Lecturers, £1,370/£1,550 p.a., plus London Allowance.

Application form and further particulars from Principal, to be returned within two weeks. (C 359)

SOUTH WESTERN ELECTRICITY BOARD

GENERAL ASSISTANT DISTRICT

ENGINEER (DRAWING OFFICE)

TORBAY

SALARY: within Class G, Grade 12, Salary Scale 4, £765/£870 per annum of the N.J.B. Agreement.

The duties of the successful candidate will include preparation of engineering drawings, mains and statistical records, and the recording and maintenance of L.V. and H.V. maps up to 33 kV.

Applicants should be capable of survey and profile, and have a knowledge of overhead design. Qualifications leading to the Higher National Certificate in Electrical Engineering are desirable and the possession of a current driving licence would be an advantage.

Applications for this post to be made on Standard Form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, Electric Hse, Union St, Torquay. Closing date for receipt of completed applications is 4 Nov., 1961.

DEMONSTRATOR

TAUNTON DISTRICT

Salary within Grade 1, £600/£700 per annum of the N.J.C. Agreement.

Duties will include the demonstration of cooking and other electrical appliances in Service Centres and consumers' premises, and advising on the selection and use of such apparatus. The successful candidate will also be required to undertake duties with exhibitions, shows, etc., including evening demonstrations for Women's Institutes and similar organisations.

Candidates should be of good general education, have some experience of public speaking, and should hold a recognised Domestic Science qualification with preferably the E.A.W. Electrical Housecraft Certificate. Possession of a current driving licence will be an advantage.

Applications for this post to be made on Standard Form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, The Parade, Taunton. Closing date for receipt of completed applications is 4 Nov., 1961. (C 351)

LONDON ELECTRICITY BOARD

ASSISTANT DISTRIBUTION ENGINEER

APPLICATIONS are invited for the above position in the Board's Borough District at 15 Penrose St, S.E.17.

Applicants should have a sound technical education to the standard of the Higher National Certificate and possess practical experience in all branches of engineering work associated with the organisation of a District distribution department.

Housing accommodation could be made available to the successful applicant.

The post is graded under Schedule A of the National Joint Board Agreement as Class H, Grade 9, £1,090 per annum, rising to £1,215 per annum, inclusive of London Allowance.

Applications stating age, qualifications and experience should be sent to the Manager at the above address within 14 days of the publication date of this notice. Please quote Ref.: PER/V/3387/T. (C 355)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

No. 1 Sub-Area

ASSISTANT CONSUMERS' ENGINEER

REQUIRED in the Southport District of the Board's No. 1 Sub-Area. Salary is within the range of £765/£870 per annum (N.J.B. F.11).

Duties include estimating for contracting work and advising consumers on electricity supply matters and appliances. Applicants should preferably have the Ordinary National Certificate in Electrical Engineering or equivalent qualification.

Appointment subject to medical examination. Pension Scheme.

Standard application forms should be forwarded to the Manager, No. 1 Sub-Area, 24 Hatton Garden, Liverpool 3, not later than 3 Nov., 1961. (C 349)

CENTRAL ELECTRICITY GENERATING BOARD

South Thames Division

BRIGHTON "A" POWER STATION

AMENDMENTS TO VACANCY NOTICE

No. 264/61, ASSISTANT ENGINEER

(ELECTRICAL MAINTENANCE)

PLEASE note that the salary scale quoted for this vacancy should be £890/£1,015 per annum. (C 365)

BRITISH ENGINE BOILER AND ELECTRICAL INSURANCE CO. LTD., Longridge Hse, Manchester 4. ELECTRICAL SURVEYORS required. Permanent positions carrying progressive salary scale £825/£1,225, with non-contributory pension. Candidates aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E. and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience. (C 370)

BP has a vacancy for a SENIOR ELECTRICAL DRAUGHTSMAN at its Head Office in London. Applicants, aged 25-35, should have completed an apprenticeship in electrical engineering and be in possession of H.N.C. (Electrical) or equivalent and have had experience on electrical installations for process plants, workshops and factories. This work will involve visits to Company installations in the U.K. and overseas. Salary according to age and experience. Non-contributory Pension Scheme. Removal and settling-in allowances payable in certain cases. Luncheon club. Write, quoting reference H.5244C, to Box 6841, c/o Hanway Hse, Clark's Pl, E.C.2. (C 328)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

DERBY/NOTTS/LEICS AREA open to TECHNICAL SALES AGENT for British Manufacturers of electro-magnetic clutches and brakes. Engineer already handling motors and complimentary equipment or one desirous of working independently.—Box 8447, Electrical Times. (C 380)

ELECTRICAL ENGINEER required at Southern Outfall Works, Belvedere, Kent, to assist in supervising the erection and commissioning of H.V. and M.V. plant including switchgear and comprehensive lighting, heating and power installation. Up to £1,125 according to qualifications and experience. Forms from Chief Engineer, (GS/T/2851/10), L.C.C., County Hall, S.E.1. (C 379)

OUTSIDE SWITCHGEAR ERECTORS experienced in erecting Metalclad Switchgear up to 11 kV, urgently required. Applications giving age and experience to: Employment Manager, Johnson and Phillips Ltd., Charlton, London, S.E.7. (C 369)

SALES LIGHTING ENGINEER required for Central and South London area, previous experience essential, car provided, contributory pension scheme. Applications will be treated in confidence and should be made to the Sales Director, F. W. Thorpe Ltd., Welby Rd, Hall Green, Birmingham 28. (C 282)

WIREMAN required for medium and large size Control Panels. Average earnings on piecework after probationary period 6s 3d to 6s 9d per hour. Apply personally or in writing to the Works Employment Officer, Fuller Electric Ltd., Fulbourne Rd, Walthamstow, E.17. (C 236)

APPOINTMENTS WANTED

GRAD. I.E.E. seeks responsible but unusual technical post, Canterbury or Wimbledon orbits, £1,400 a year.—Box No. 8435, Electrical Times. (C 270)

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WANTED

COIL WINDING MACHINES of any type. Box No. 8443, Electrical Times. (C 375)

WANTED for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of second-hand machinery and plant for re-use.—W. and H. Cooper Ltd., 17 Brady St, Bethnal Green, E.1. (C1)

WORK WANTED

METALWORK.—All types of cabinets, chassis, racks, etc., to your own specification.—Philpotts Metalworks Ltd., Chapman St, Loughborough. (C 10)

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A.A. ELECTRICAL CO. for A.C.-D.C. MOTORS, Switchgear, Exhaust Fans, Hoists, Reduction Gears, new or reconditioned units.—CHI 5105, 67 Rothschild Rd, W.4. (C 2)

A.C. AND D.C. MOTORS. Generators, new and reconditioned. REWINDS and repairs promptly executed.—Service Electric Co. Ltd., Honeypot La, Stanmore, Middx, Edgware 5566. (C 8)

HOUSE-SERVICE METERS, all types can be obtained by return from Selectrics. Dept. E.T., Meter Hse, Factory Row, Castle Circus, Torquay. Phone 7218. (C 6)

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For Industrial Processes
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INFRA RED WORKS, HIGH ROAD, N.11.
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HOUSE-SERVICE METERS, A.C. or D.C., quarterly or prepayment. — Universal Electrical, 221 City Rd, London, E.C.1. (C 3)

PURLEY CHOKES AND BALLASTS. Our 80 W tapped h.p.f. ballast with starter switchgear-holder incorporated is proving itself the most popular unit. Suitable for most fittings, 57s 6d each subject. —F. W. Blanshard Ltd. (Dept. E.T.), Purley, Surrey. Uplands 4818/9. (C 4)

SURPLUS CONDUIT FITTINGS available. Write for detailed list.—Box 8449, Electrical Times. (C 381)

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A SECOND mortgage our speciality; £2 6s 8d monthly repayments on each £100 borrowed. Also 100% Deferred Mortgage; 95% Immediate. Business and Investment Finance, Cranbrook Mortgage Bureau, Department C.H.9, 49 Cranbrook Rd, Ilford 3615 (3 lines). (C 12)

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MAINTENANCE ENGINEERS — Read "Electrical Fault Diagnosis." A quick guide to the detection and correction of electrical machine troubles. Price 15s post free from Book Department, Electrical Times, Sardinia Hse, Sardinia St, London W.C.2.

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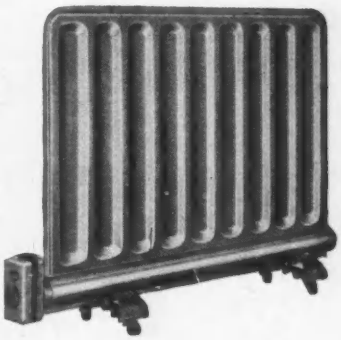

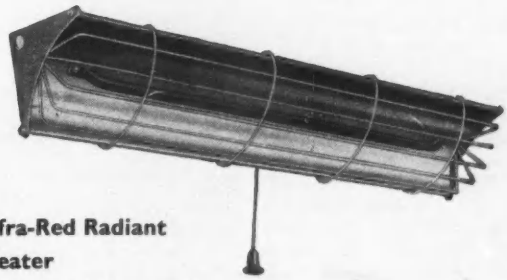

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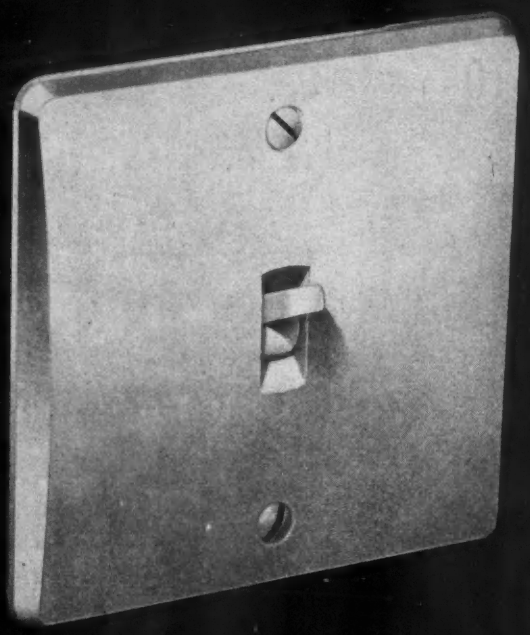

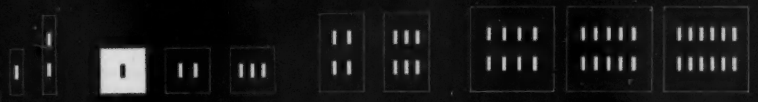

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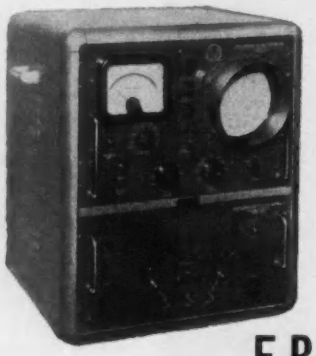

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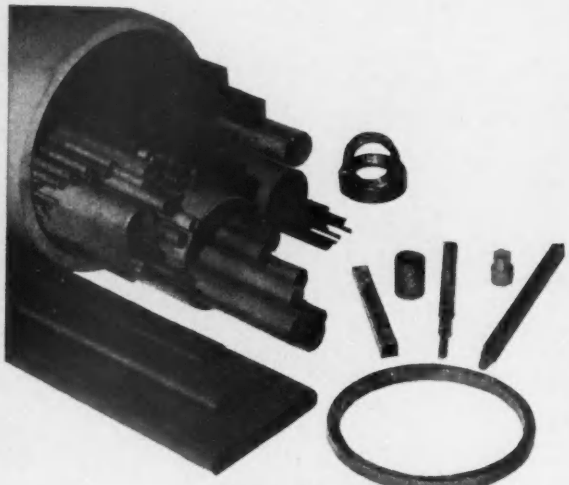

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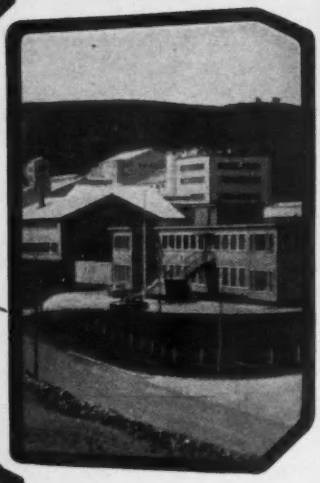

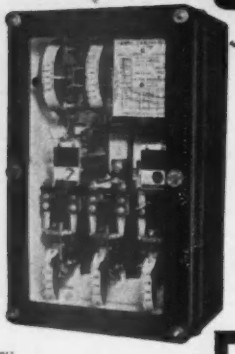

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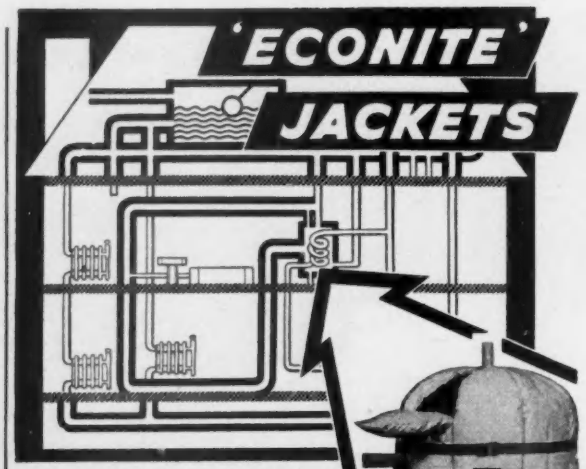

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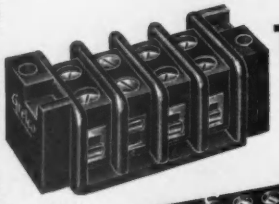

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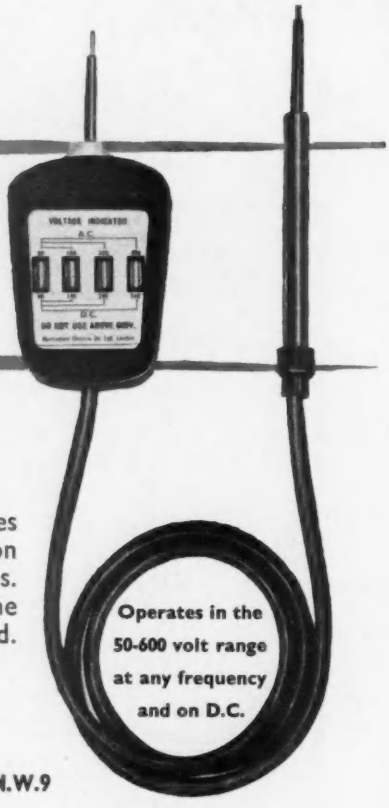

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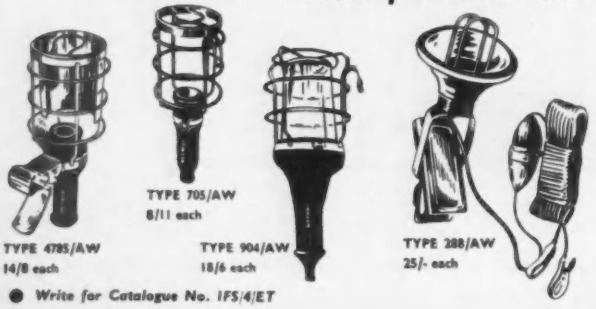

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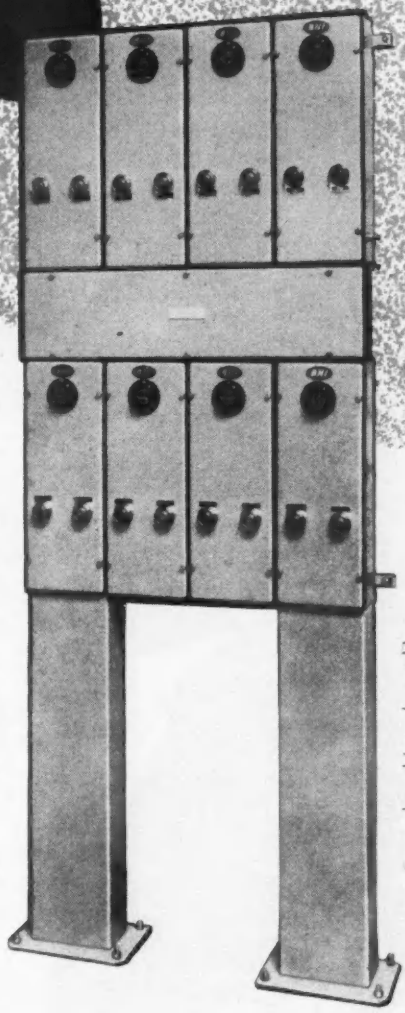

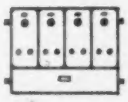

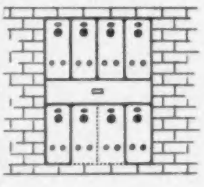

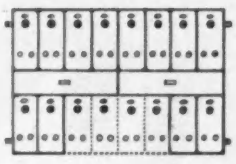

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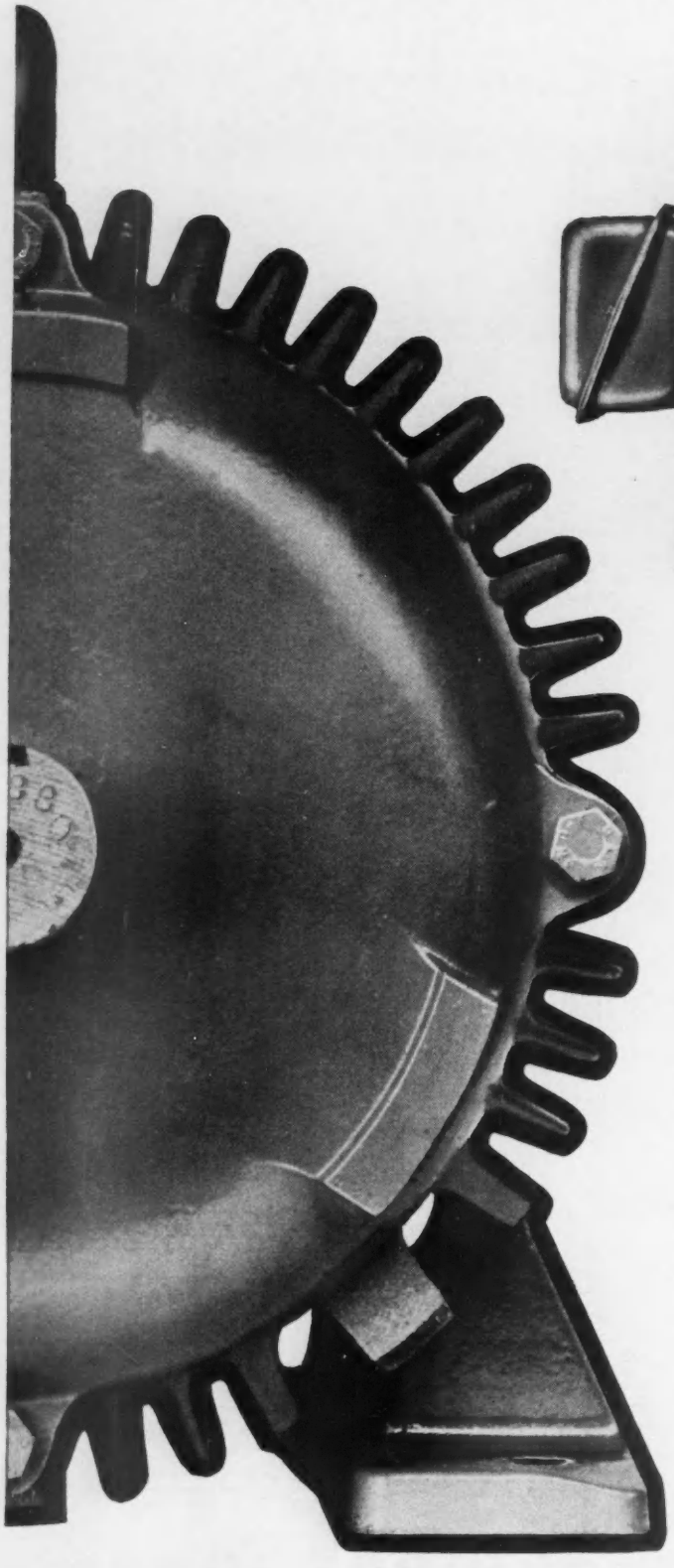

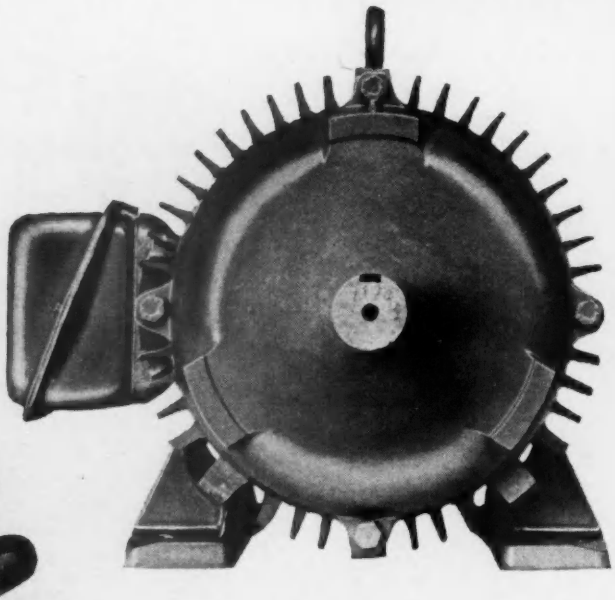

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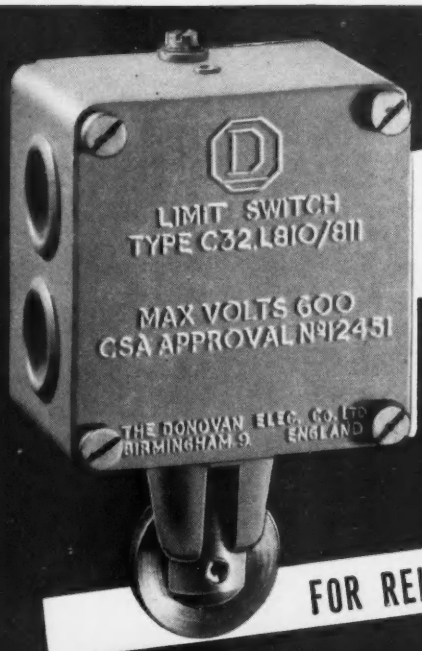

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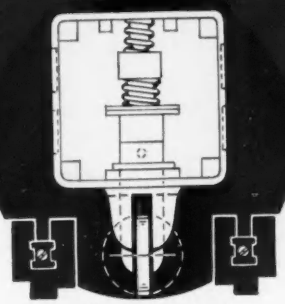
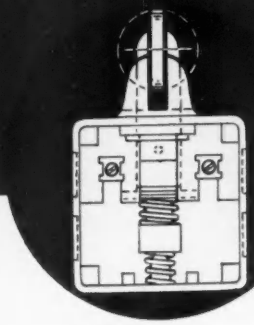
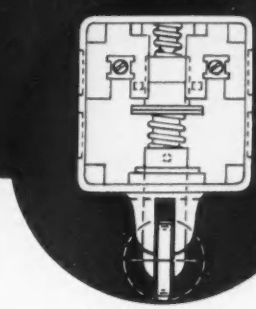


Removable Contact Blocks can be quickly removed and re-inserted into new positions as indicated in these diagrams.



Interior showing NORMALLY CLOSED position.



Interior showing NORMALLY OPEN position.

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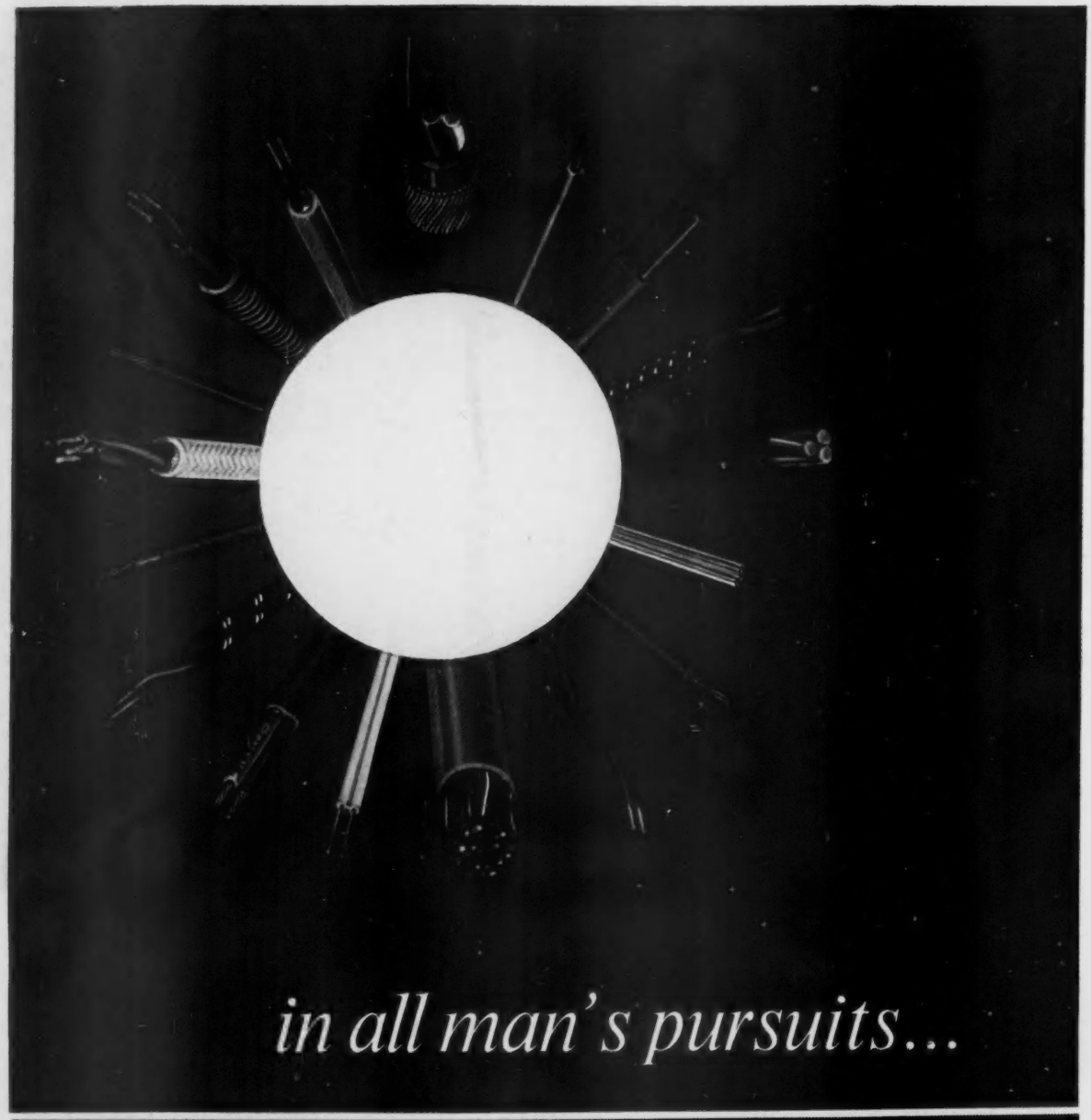

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